AI #78951

TRANSPORTATION CABINET
Frankfort, Kentucky 40622
www.kentucky.gov

Ernie Fletcher
Governor

Bill Nighbert
Secretary

Marc Williams
Commissioner of Highways

May 16, 2007

Division of Water
Water Quality Certification Section
ATTN: Jenni Garland
14 Reilly Road
Frankfort, KY 40601

SUBJECT: **Section 401 – Water Quality Certification**
Breathitt County Item No. 10-0270.60/.70
KY-15 Relocation

Dear Ms. Garland:

We recently submitted a Section 404 Permit application to the Louisville District Corps of Engineers for the above subject project. This letter is intended to make you aware of the project and the impacts associated and to request a Water Quality Certification. This project is located in Breathitt County, Kentucky and is approximately 2.1 miles in length. The purpose of the project is to reconstruct KY-15 from Jackson to Still House Hollow. This project impacts waters of the United States and will require a permit from the Army Corps of Engineers as well as a Water Quality Certification from the KY Division Water.

At the present time, the scheduled letting date for this project is March 14, 2008. All approvals must accompany the Notice to Contractors, typically distributed two months in advance, going out on January 11, 2008. Your assistance toward meeting this date is greatly appreciated.

Enclosed are drawings, a summary sheet of impacts, location map, plan sheets, mitigation discussion, and habitat assessments. If you have any questions or need additional information, please contact me at (502) 564-7250.

Sincerely,

Ronald B. Rigney II

Ronald B. Rigney, II
Permits Coordinator
Division of Environmental Analysis

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES & ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER

APPLICATION FOR PERMIT TO CONSTRUCT ACROSS OR ALONG A STREAM AND / OR WATER QUALITY CERTIFICATION

Chapter 151 of the Kentucky Revised Statutes requires approval from the Division of Water prior to any construction or other activity in or along a stream that could in any way obstruct flood flows or adversely impact water quality. *If the project involves work in a stream, such as bank stabilization, dredging or relocation, you will also need to obtain a 401 Water Quality Certification (WQC) from the Division of Water*. This completed form will be forwarded to the Water Quality Branch for WQC processing. The project may not start until all necessary approvals are received from the KDOW. For questions concerning the WQC process, contact John Dovak at 502/564-3410.

If the project will disturb more than 1 acre of soil, you will also need to complete the attached Notice of Intent for Storm Water Discharges, and return both forms to the Floodplain management Section of the KDOW. This general permit will require you to create and implement an erosion control plan for the project.

1. OWNER: Kentucky Transportation Cabinet
   Give name of person(s), company, governmental unit, or other owner of proposed project.
   MAILING ADDRESS: 200 Mero Street, 6th Floor, Frankfort, KY 40622
   TELEPHONE #: 502-564-3130 EMAIL:

2. AGENT: Ronald Rigney,II – Permits Coordinator Division of Environmental Analysis
   Give name of person(s) submitting application, if other than owner.
   ADDRESS: 200 Mero Street, 5th Floor, Frankfort, KY 40622
   TELEPHONE #: 502-564-7250 EMAIL: RonB.RigneyII@ky.gov

3. ENGINEER: P. E. NUMBER
   Contact Division of Water if waiver can be granted
   TELEPHONE #: EMAIL:

RECEIVED
MAY 17 2007
WATER QUALITY
CERTIFICATION SECTION

4. DESCRIPTION OF CONSTRUCTION:
   Describe the type and purpose of construction and describe stream impact
   This project concerns the construction of two sections (2.4 miles) of the KY15 reconstruction project. This is on new alignment, requiring the placement of several new culverts, relocation of streams, and the development of two excess fill sites. No wetlands are impacted. Mitigation for the stream impacts will be by payment of an in-lieu fee due to limited opportunities on-site.

5. COUNTY: Breathitt NEAREST COMMUNITY: Jackson

6. USGS QUAD NAME: Jackson LATITUDE/LONGITUDE: N37-34-20,W83-23-32 (Shacks Br.)

7. STREAM NAME: Shacks Br. & N.F. of KY River WATERSHED SIZE (in acres): 423.4 (Site 6, having the largest)

8. LINEAR FEET OF STREAM IMPACTED: See tables for impacts requiring mitigation.

9. DIRECTIONS TO SITE: From Lexington on I-64, take the Bert Combs Mountain Parkway to Campton. Take KY15 at Campton, heading southeast to the City of Jackson. The project begins with an interchange near the N.F. Kentucky River "cutoff" that forms Panbowl Lake. From this point, the road will head north overland on a new alignment, crossing Shacks Branch. It continues north and then west to rejoin existing KY15 where construction of a previously permitted section is underway.

10. **IS ANY PORTION OF THE REQUESTED PROJECT NOW COMPLETE?** ☐ Yes ☑ No If yes, identify the completed portion on the drawings you submit and indicate the date activity was completed. DATE _____

11. **ESTIMATED BEGIN CONSTRUCTION DATE:** Fall of 2007

12. **ESTIMATED END CONSTRUCTION DATE:** Three years from start (2010)

13. **HAS A PERMIT BEEN RECEIVED FROM THE US ARMY CORPS OF ENGINEERS?** ☐ Yes ☑ No If yes, attach a copy of that permit. Application has been mailed to COE.

14. **THE APPLICANT MUST ADDRESS PUBLIC NOTICE**

(a) ____ **Public notice in newspaper having greatest circulation in area (provide newspaper clipping or affadavit)**

____ **Adjacent property owner(s) affadavits (Contact Division of Water for requirements.)**

(b) ✓ **I REQUEST WAVER OF PUBLIC NOTICE BECAUSE:**
KYTC projects are exempt.

Contact Division of Water for Requirements.

15. **I HAVE CONTACTED THE FOLLOWING CITY OR COUNTY OFFICIALS CONCERNING THIS PROJECT:**
N/A

Give name and title of person(s) contacted and provide copy of any approval city or county may have issued.

16. **LIST OF ATTACHMENTS:**

List plans, profiles, or other drawings and data submitted. Attach a copy of a 7.5 minute USGS topographic map clearly showing the project location.

A vicinity map, drawings of impact sites, and a mitigation discussion are attached.

17. **I, _____ (owner) CERTIFY THAT THE OWNER OWNS OR HAS EASEMENT RIGHTS ON ALL PROPERTY ON WHICH THIS PROJECT WILL BE LOCATED OR ON WHICH RELATED CONSTRUCTION WILL OCCUR (for dams, this includes the area that would be impounded during the design flood).**

18. **REMARKS:** An Individual Permit application has been submitted to the Louisville District Corps of Engineers.

I hereby request approval for construction across or along a stream as described in this application and any accompanying documents. To the best of my knowledge, all the information provided is true and correct.

SIGNATURE: David M. Waldon

Owner or Agent sign here. (If signed by Agent, a Power of Attorney should be attached.)

DATE: 5/15/07

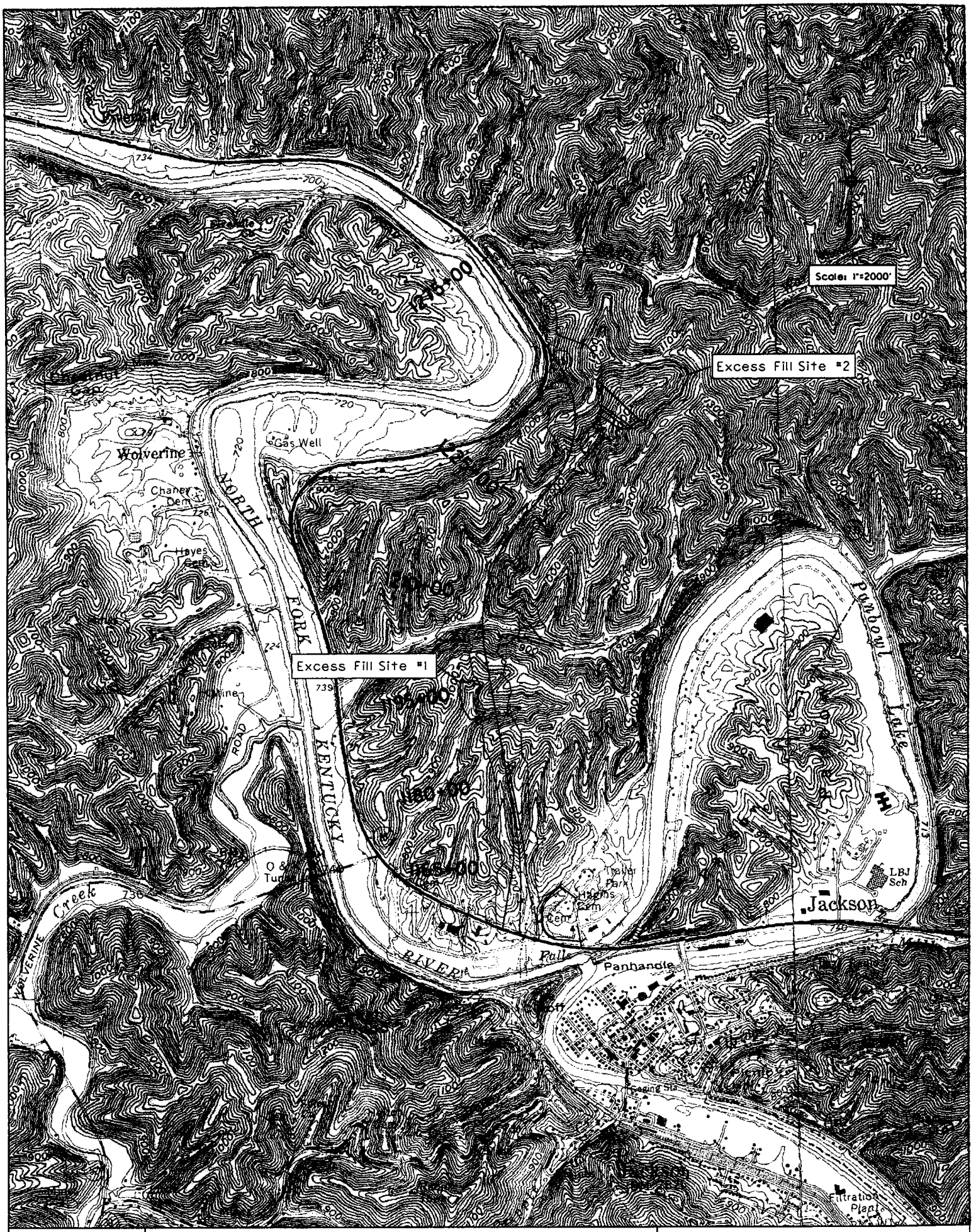
SIGNATURE OF LOCAL FLOODPLAIN COORDINATOR: N/A (exempt by regulation)

Permit application will be returned to applicant endorsed by the local floodplain coordinator.

DATE: _____

SUBMIT APPLICATION AND ATTACHMENTS TO:

Floodplain Management Section
Division of Water
14 Reilly Road
Frankfort, KY 40601



Kentucky Transportation	KY 15 Reconstruction: Vicinity Map				
	COUNTY: Breathitt	STATE: Kentucky	NEAR: City of Jackson	ITEM: 10-270.6 & .7	

Kentucky Transportation	KY 15 Reconstruction: Vicinity Map			
	COUNTY: Breathitt	STATE: Kentucky	NEAR: City of Jackson	ITEM: 10-270.6 & .7

ATTACHMENT
Block 19

Purpose and Need

The "Statewide Transportation Plan (FY1995-2014)" identified KY15 from KY28 to Campton as needing improvement to meet the strategic goals of the plan. KY15 has been designated for inclusion on the National Highway System (NHS), being identified as an important corridor both locally and regionally.

The existing roadway has 2 lanes except for short segments within the Jackson city boundaries where 4 lanes are utilized; and has a horizontal alignment that follows the meanders of the river and larger creeks. This has resulted in numerous curves and greatly reduced passing opportunities. These deficiencies, combined with congestion due to the densely-spaced entrances for businesses and subdivisions, as well as the high traffic volumes, have resulted in numerous accidents and fatalities. This project is a portion of the overall plan to reconstruct KY15 (widen and realign) to eliminate those safety concerns as well as upgrade the Level of Service of the road. The project will allow for through traffic bypassing the downtown of the city of Jackson, reducing the congestion and "bottlenecking" that presently exists there. Accessibility for police and fire projection will also be improved. This project will join a section of KY15 currently under a reconstruction.

ATTACHMENT
Block 24

Adjoining Property Owners

City of Jackson
c/o Michael Miller, Mayor
333 Broadway Street
Jackson, KY 41339

Thomas Investments, Inc.
c/o Logan Thomas
P.O. Box W
Beattyville, KY 41311

Roscoe & Louise Terry
520 Hwy 15 N
Jackson, KY 41339

Thomas & Carol Miller
P.O. Box 952
Jackson, KY 41339

William Back
959 Highland Avenue
Jackson, KY 41339

LBG Holdings, LLC
c/o Helton Branham
P.O. Box 3130
Frankfort, KY 40602

Roy & Louise Terry
825 Issac Shelby Circle E
Frankfort, KY 40601

Gene & Myrtle Watts
Watts Funeral Home
P.O. Box 945
Jackson, KY 41339

Juanita Callahan
P.O. Box 106
Jackson, KY 41339

Ed Herald
c/o Ted Edmonds
1257 Beattyville Road
Jackson, KY 41339

Diocese of Covington
Holy Cross Church
1140 Madison Ave., Box 192
Covington, KY 41011

Christopher & Courtney Neace
1935 Lick Branch Armory Road
Jackson, KY 41339

Rose Ventures, LTD.
P.O. Box 943
Jackson, KY 41339

Farm Bureau Insurance
P.O. Box 1210
Jackson, KY 41339

Jackson Enterprise, Inc.
19 Brewer Drive
Jackson, KY 41339

Jefferson Gas Transmission Co., Inc.
P.O. Box 24032
Lexington, KY 40524-4032

Mary Louise Calhoun
P.O. Box 423
Jackson, KY 41339

Michael & Stephanie Watkins
2594 Quicksand Road
Jackson, KY 41339

ATTACHMENT
Block 24 (cont.)

Dorothy Make Trust
126 Burgess Avenue
Dayton, OH 45415-2604

Ethel Back
c/o Sharon Jewell
722 Joycie Lane
Waynesville, OH 45068

Raymond Back
2345 N Main Street
Dayton, OH 45405

Jayne Risner
7267 Meeker Creek Drive
Jackson, KY 41339

Brian & Melissa Banks
764 Shacks Branch Road
Jackson, KY 41339

William Back
665 Hwy 15 North
Jackson, KY 41339

JP & Barbara Deaton
329 Shacks Branch Road
Jackson, KY 41339

William Hurst
4074 KY 205
Campton, KY 41301

Jeffrey Howell
P.O. Box 19
Jackson, KY 41339

Wayne & Sherri Simpson
710 Shacks Branch Road
Jackson, KY 41339

SUMMARY OF IMPACTS
Item No. 10-270.60 & .70

(Stations are along the mainline unless otherwise noted)
The North Fork Kentucky River will be referred to as North Fork in the descriptions.

1. Right Sta. 1149+00 to Left Sta. 1170+00 – Upstream to downstream: construct 403' of inlet channel, merging with a 535' pipe culvert (Sta. 1167+53.7) with 130' of inlet channel, at the inlet of a 804' pipe culvert (Sta. 1161+79.4). From the culvert outlet construct 486' of outlet/inlet channel to a 553' pipe culvert (KY15, Sta. 36+05) with 32' of outlet channel improvement; on **intermittent/perennial** tributaries to North Fork. This replaces **1580'** of **perennial** (Reaches 3C, 3D) and **98'** of **ephemeral** (EPH.#1) channel on one tributary, and **391'** of **perennial** (Reach 3B), **225'** of **intermittent** (Reach 3A) and **150'** of **ephemeral** (EPH.#2) channel on the other; as well as 638' of existing pipe culvert to the river. The total impact to waters is **0.13 acres (0.11 acres** of **perennial, 0.01 acres** of **intermittent**, and **0.01 acres** of **ephemeral)**. The drainage area affected is **73.0 acres**. The site is located at N37-33-32, W83-23-25. (Individual Permit, WQC)

2. Panbowl Rd. Sta. 28+40 to Sta. 44+50 - Upstream to downstream: Drain and fill an existing **0.67 acre pond,** and construct 89' of pipe culvert (Brewers Dr., Sta. 20+61.30); on an **intermittent** tributary (Reach 2). It discharges into 115' of undisturbed channel; then into 847' of new inlet channel for a 594' pipe culvert (Panbowl Rd., Sta. 27+77.6 to Sta. 33+00), with 75' of outlet channel to Panbowl Lake. This replaces **57'** of channel (and 32' of existing culvert) at Brewers Drive, **427' of assumed length** through pond, **40'** of pond outlet channel; leading to 784' of existing storm sewer that outlets into the North Fork. The impact to waters is **0.04 acres**. The drainage area affected is **23.7 acres**. The site is located at N37-33-32, W83-23-20. (Individual Permit, WQC)

3. Sta. 1181+75 – Fill **333'** of **ephemeral** tributary to North Fork. The impact to waters is **0.03 acres**. The drainage area affected is **6.3 acres**. The site is located at N37-33-56, W83-23-27. (Nationwide Permit No. 14)

4. Sta. 1185+35 – Fill **455'** of **ephemeral** (EPH.#1 & 2) tributaries to North Fork. The impact to waters is **0.04 acres**. The drainage area affected is **5.9 acres**. The site is located at N37-34-00, W83-23-28. (Nationwide Permit No. 14)

5. Sta. 1191+00 to Sta. 1198+50 – Construct 401' of pipe culvert (Sta. 1191+11.4), with 15' of outlet channel improvement, and develop Excess Fill Site #1; on **ephemeral** tributaries to North Fork. The culvert replaces **437'** of existing channel (EPH.#1). Fill Site #1 (and roadway fill) replaces **1008'** (EPH.#2) and **343'** (EPH.#3) of existing channel. The total impact to waters is **0.26 acres** (0.06, 0.16, and 0.04, respectively). The drainage area affected is **41.9 acres**. The site is located at N37-34-05, W83-23-28 acres. (Individual Permit)

6. Sta. 1203+00 to Right Sta. 1239+00 – Upstream to downstream (starting below Excess Fill Site #2): construct 383' of drainage channel to 260' of pipe culvert (Sta. 1235+32), that outlets into 3428' of new stream channel (including 96' of entrance pipe at Left Sta. 1226+50). This is on a **perennial** tributary to Shacks Branch. This replaces **3469'** of stream (Reach 8A, 8B & lower portion of 8C). The impact to waters is **0.34 acres** of perennial. **Other impacts associated with this site (upstream to downstream) are:**

   Left Sta. 1238+00 – Fill **184'** of **ephemeral** tributary (EPH.#14). The impact to waters is **0.01 acres**.

   Right Sta. 1235+50 – Fill **333'** of **ephemeral** tributary (EPH.#13). The impact to waters is **0.02 acres**.

   Left Sta. 1228+50 – Fill and relocate **two ephemeral** tributaries (EPH.#11 & 12). This replaces **1372'** of existing channel. The impact to waters is **0.08 acres**.

   Sta. 1227+50 – Fill, and construct 278' of pipe culvert with 159' of inlet channel, on **three ephemeral** tributaries (EPH.#8, 9 & 10). This replaces **1014'** of existing channel. The impact to waters is **0.03 acres**.

   Sta. 1218+50 – Fill, and construct 339' of pipe culvert, on an **ephemeral** tributary (EPH.#7) This replaces **346'** of existing channel. The impact to waters is **0.02 acres**.

   Left Sta. 1216+70 – Fill and relocate **two ephemeral** tributaries (EPH.#5 & 6). This replaces **968'** of existing channel. The impact to waters is **0.09 acres**.

   Left Sta. 1209+30 – Fill **439'** of **ephemeral** tributary (EPH.#4). The impact to waters is **0.03 acres**.

   Right to Left of Sta. 1205+73 – Construct 380' of inlet channel to a 68' pipe culvert (Shacks Br. Sta. 47+66) with 10' of outlet channel, to an undisturbed portion of stream (435' in length); leading to 1153' of pipe culvert (Sta. 1205+73), with 100' of outlet channel improvement. This is on Shacks Branch, a **perennial** stream (Reach 7A, 7B & 7C). Additionally, construct 84' of pipe culvert (Shacks Br. Sta.41+72) in, and fill, an **ephemeral** tributary (EPH.#2); and fill **two another ephemeral** tributaries (EPH.#1 & 3). This replaces **1903'** of **perennial** and **794'** of **ephemeral** channel. The impact to waters is **0.23 acres** of perennial and **0.08 acres** of ephemeral.

The total impact to waters for the site is **0.93 acres** (**0.57 acres** of **perennial** and **0.36 acres** of **ephemeral**). The drainage area affected is **423.4 acres** (measured at the most downstream point of impact on Shacks Branch). The site is located from N37-34-20, W83-23-32 to N37-34-46, W83-23-11. (Individual Permit, WQC)

7. Left Sta. 1239+00 to Left Sta. 1249+00 – Develop Excess Fill Site #2. This replaces **649'** of **perennial** (upper portion of Reach 8C), **1410'** of **intermittent** (Reach 8D), and **1951'** of **ephemeral** channel (EPH.#15 to #22). The impact to waters is **0.06 acres** of perennial, **0.23 acres** of intermittent, and **0.18 acres** of ephemeral. The drainage area affected is **62.9 acres**. The site (midpoint) is located at N37-34-54,W83-23-02. (Individual Permit, WQC)

8. Left Sta. 1247+50 to Left Sta. 1251+49 – Construct 129' of pipe culvert (Appr. Rd., Sta. 29+70.00), with 323' of outlet channel, and a stormwater collection system upstream for the mainline road; on **ephemeral** tributaries to North Fork. The culvert collects inflow from the stormwater system as well as overland flow into a drop box inlet. This replaces a total of **1060'** of existing channel (566', 300' and 194', respectively). The impact to waters is **0.07 acres**. The drainage area affected is **12.3 acres**. The site is located at N37-34-57, W83-23-13. (Nationwide Permit No. 14)

9. Right Sta. 1253+20 to Right Sta. 1254+40 – Fill three **ephemeral** channels due to roadway fill. This replaces a total of **546'** of existing channel (204', 186' and 156', respectively). The impact to waters is **0.03** acres. The drainage area affected is **6.0 acres**. The site is located at N37-35-01, W83-23-15. (Nationwide Permit No. 14)

10. Sta. 1258+05 – Construct 189' of pipe culvert, with 100' of inlet and 20' of outlet channel improvements; on an **intermittent** tributary (Reach 11) to North Fork. This replaces **249'** of existing channel and **80'** of existing culvert. The impact to waters is **0.03 acres**. The drainage area affected is **12.7 acres**. The site is located at N37-35-05, W83-23-16. (Nationwide Permit No. 14)

NOTE: Due to the length of some impacted streams, multiple assessments were performed. Those segments are identified by use of an "A, B, D, etc." after the reach number.

Mitigation Discussion

Breathitt Co., Item No. 10-270.6 & .7

This project will impact over two miles of stream that require mitigation. The impacts are due primarily to fill for the roadway embankment and the need for excess fill material sites.

Although the roadway alignment follows long reaches of existing streams, any shift to avoid the streams would result in a large increase in excavation; generating much more material to dispose of. Disposal would require other streams to be impacted, as well as significantly increase the cost of the project. Efforts have been made to minimize stream impacts by reducing the need for material disposal sites. Initial proposals involved five or more sites for these two sections of the reconstruction. This has been reduced to two sites, one of which impacts ephemeral streams. Where the roadway embankment was already impacting a stream, the cross section of the roadway was increased to account for some of the material, causing only slight increases in impacts to ephemeral tributaries. This allowed avoidance of potential impacts to other intermittent and/or perennial streams for disposal sites.

Most of the mitigation needs are for impacts to streams in two major areas, Sites 1 and 6. Mitigation on-site was not practical for various reasons. Site 1 involves long culverts with limited open channel available. The main channel in this area has already been placed in a long culvert before reaching the river. At Site 6, the major impact area for this project, there will be a long open channel to replace an impacted perennial/intermittent tributary to Shacks Branch. However, the channel will be placed much higher on fill and will have a steep gradient section before re-entering Shacks Branch. Additionally, there is little opportunity to provide meanders or other natural features typical for a "natural stream" design. Past efforts to provide mitigation on fill have not been favorably received by the Division of Water and other regulatory agencies. The steep outlet channel section would also be an obstruction to fish passage. Therefore, it is proposed to provide an in-lieu fee payment for mitigation.

No wetlands were identified within the project corridor.

SUMMARY OF IMPACTS ALONG ROADWAY REQUIRING MITIGATION

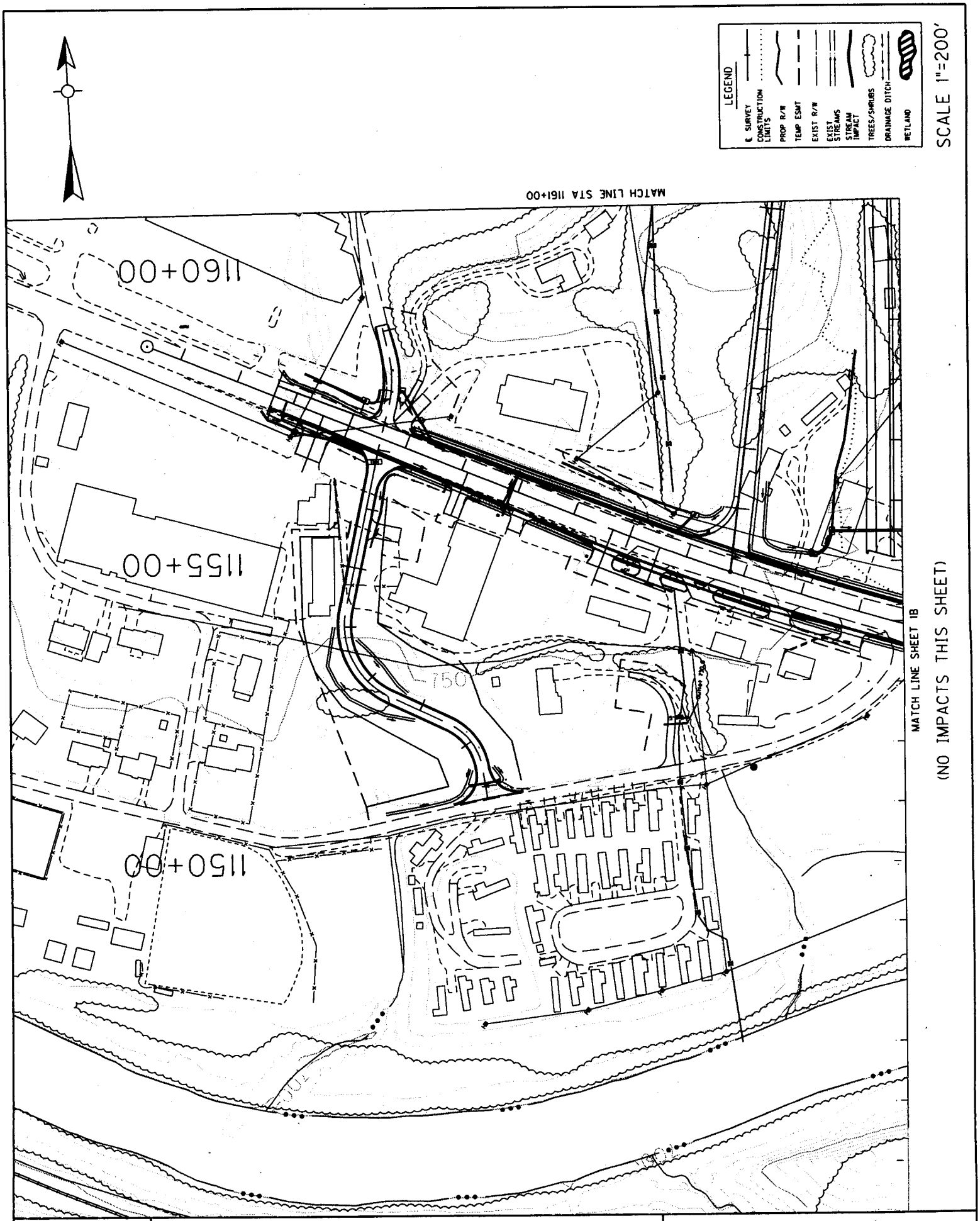
Site Number	Watershed, Stream I.D.	Project Station	Stream Type	EPA RBP Score	Impact Length (ft)	Impact Area (ac)	Impact Type	In-lieu Fee Amount ($)
1	Reach 3B	1164+90 to Rt. 1168+30	Perennial	123	391	0.02	culvert	117,534.60
	Reach 3C	1155+60 to 1164+90	Perennial	123	961	0.05	culvert	266,389.20
	Reach 3D	1164+90 to Lt. 1170+50	Perennial	127	619	0.04	culvert	187,185.60
2	Reach 2	28+40 to 44+50	Intermittent	93	97+427(pond)	0.04	culvert & fill	67,596.00
5	Eph.#2 (Roadway)*	1197+00	Ephemeral	117	253	0.04	fill	24,591.60
6	Reach 7A	Right 1205+73	Perennial	78	477	0.03	culvert & fill	127,716.75
	Reach 7B	1205+73	Perennial	115	666	0.09	culvert	187,012.80
	Reach 7C	Left 1205+73	Perennial	95	760	0.11	culvert	203,490.00
	Reach 8A	1206+60 to 1218+60	Perennial	98	1262	0.09	fill	352,098.00
	Reach 8B	1218+60 to 1235+30	Perennial	132	1790	0.21	fill	550,962.00
	Reach 8C (Roadway)	1235+30 to Rt. 1238+00	Perennial	121	417	0.04	fill	124,599.60

* If Fill Site #1 is not used, this impact will not require mitigation

Total Fee = 2,209,176.15

SUMMARY OF IMPACTS AT EXCESS FILL SITES REQUIRING MITIGATION

Site Number	Watershed, Stream I.D.	Project Station	Stream Type	EPA RBP Score	Impact Length (ft)	Impact Area (ac)	Impact Type	In-lieu Fee Amount ($)
5	Eph.#2 (Fill)	Fill Site #1	Ephemeral	117	755	0.12	fill	73,386.00
							Fill Site #1=	73,386.00
7	Reach 8C (Fill)	Fill Site #2	Perennial	121	649	0.06	fill	193,921.20
	Reach 8D		Intermittent	126	1410	0.23	fill	284,256.00
							Fill Site #2=	478,177.20
							Total Fee =	551,563.20



Kentucky Transportation	PROJECT: KY 15		STREAM: Tributary to N. F. Kentucky River		
	COUNTY: BREATHITT	STATE: KENTUCKY	START OF PROJECT TO 1161+00	ITEM: 10-270.6 & .7	PLAN SHEET 1A

Kentucky Transportation

PROJECT: KY 15 | COUNTY: BREATHITT | STATE: KENTUCKY | START OF PROJECT TO 1161+00 | ITEM: 10-270.6 & .7 | PLAN SHEET 1B

STREAM: Tributary to N. F. Kentucky River

SITE 1
REACH 3C
Contained within existing culvert

1150+00

MATCH LINE SHEET 1A

1155+00

SITE 2
REACH 2
IMPACT = 97'
POND = 0.62AC.

POND

1160+00

MATCH LINE STA 1161+00

SITE 1
REACH 3C
Continued on Sheet 2

LEGEND

- SURVEY
- CONSTRUCTION LIMITS
- PROP R/W
- TEMP ESMT
- EXIST R/W
- EXIST STREAMS
- STREAM IMPACT
- TREES/SHRUBS
- DRAINAGE DITCH
- WETLAND

SCALE 1"=200'

Kentucky Transportation

PROJECT: KY 15 | COUNTY: BREATHITT | STATE: KENTUCKY | STA 1161+00 to STA 1176+00 | ITEM: 10-270.6 & .7 | PLAN SHEET 2

STREAM: Tributary to N. F. Kentucky River

MATCH LINE STA 1161+00

SITE 1
Reach 3C
Impact = 961'

SITE 1
Reach 3B
Impact = 391'

SITE 1
EPH. #2
Impact = 150'

SITE 1
EPH. #1
Impact = 98'

SITE 1
Reach 3D
Impact = 619'

SITE 1
Reach 3A
Impact = 225'

1165+00

1170+00

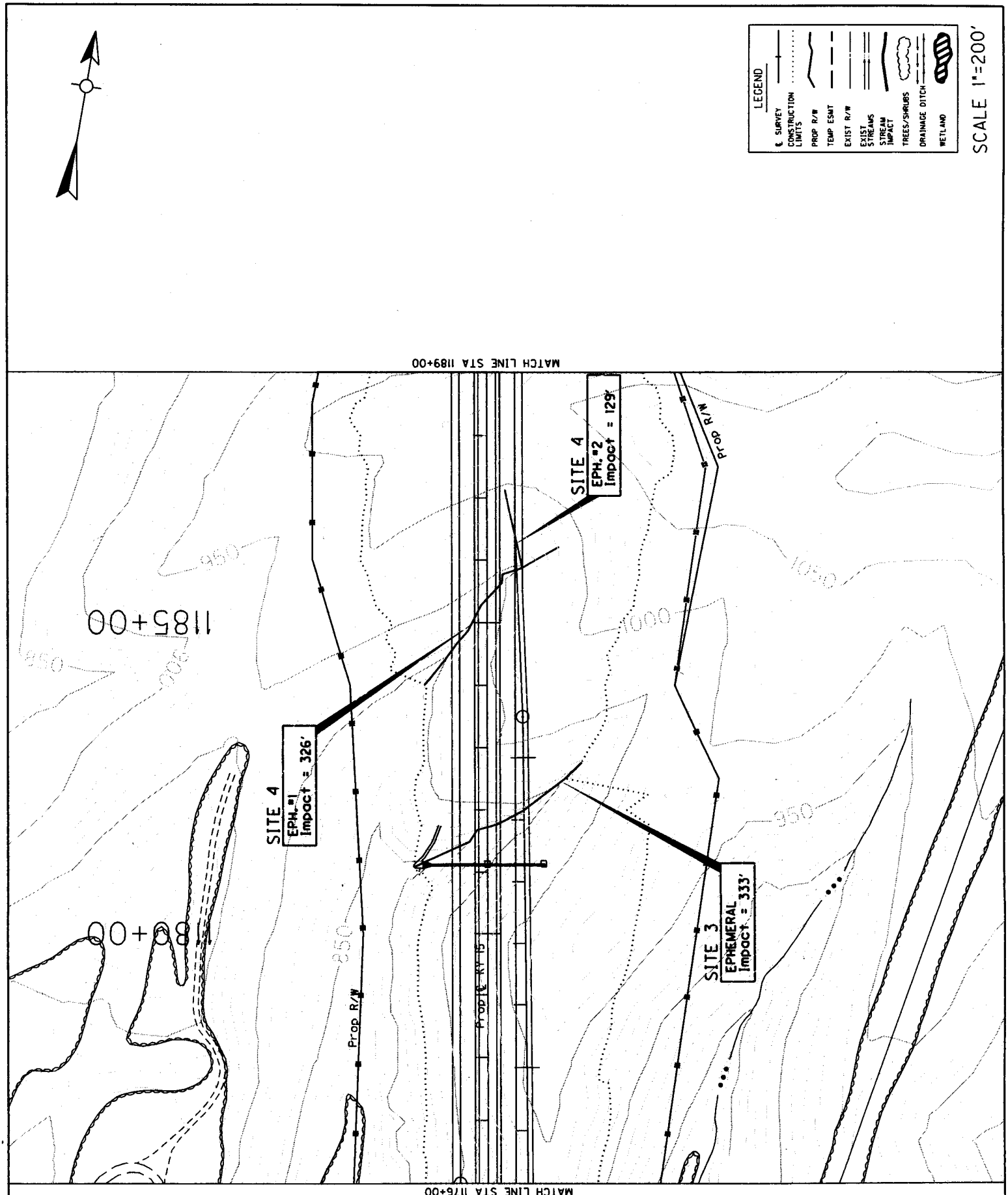
1175+00

MATCH LINE STA 1176+00

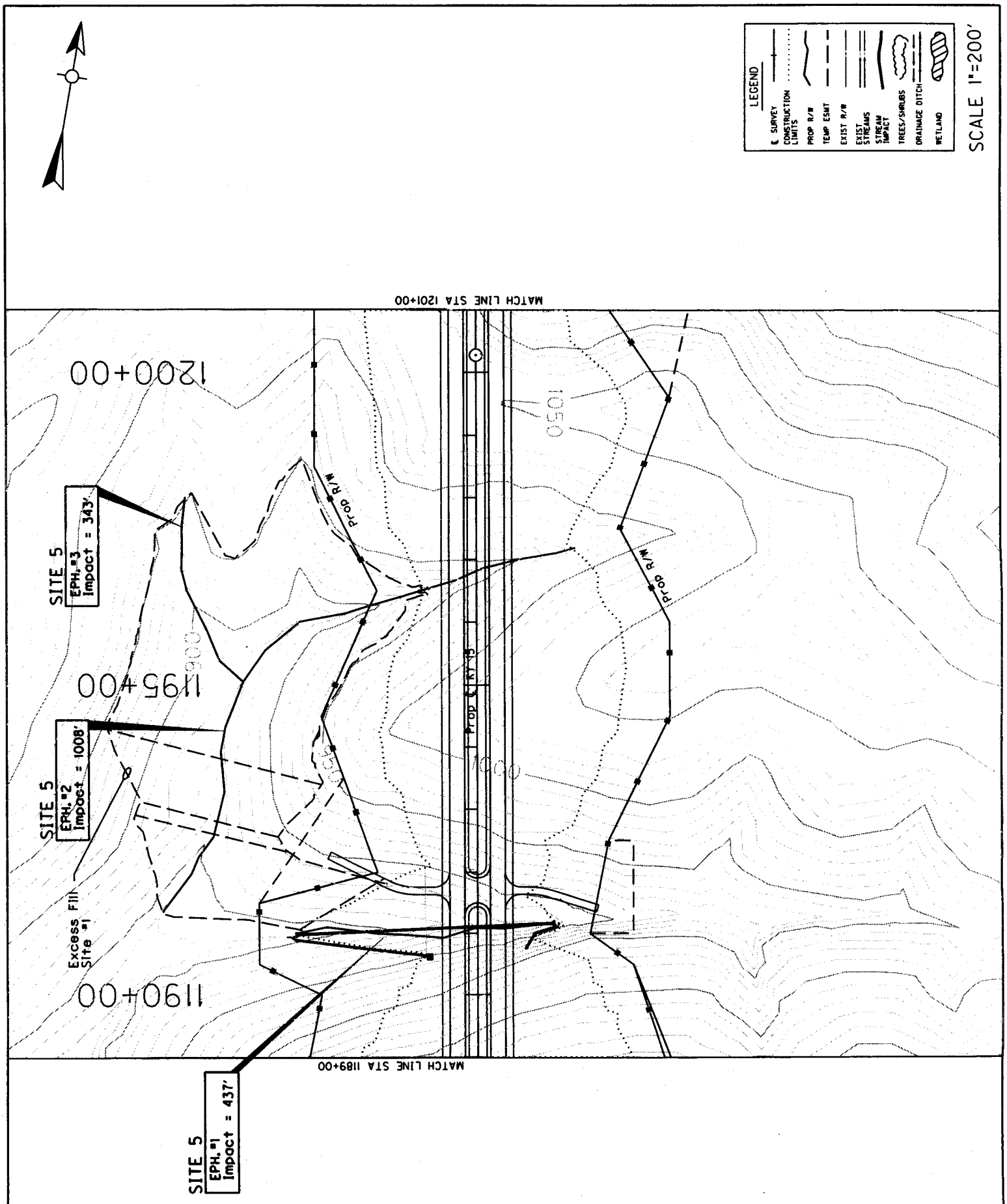
LEGEND

- ℄ SURVEY
- CONSTRUCTION LIMITS
- PROP R/W
- TEMP ESMT
- EXIST R/W
- EXIST STREAMS
- STREAM IMPACT
- TREES/SHRUBS
- DRAINAGE DITCH
- WETLAND

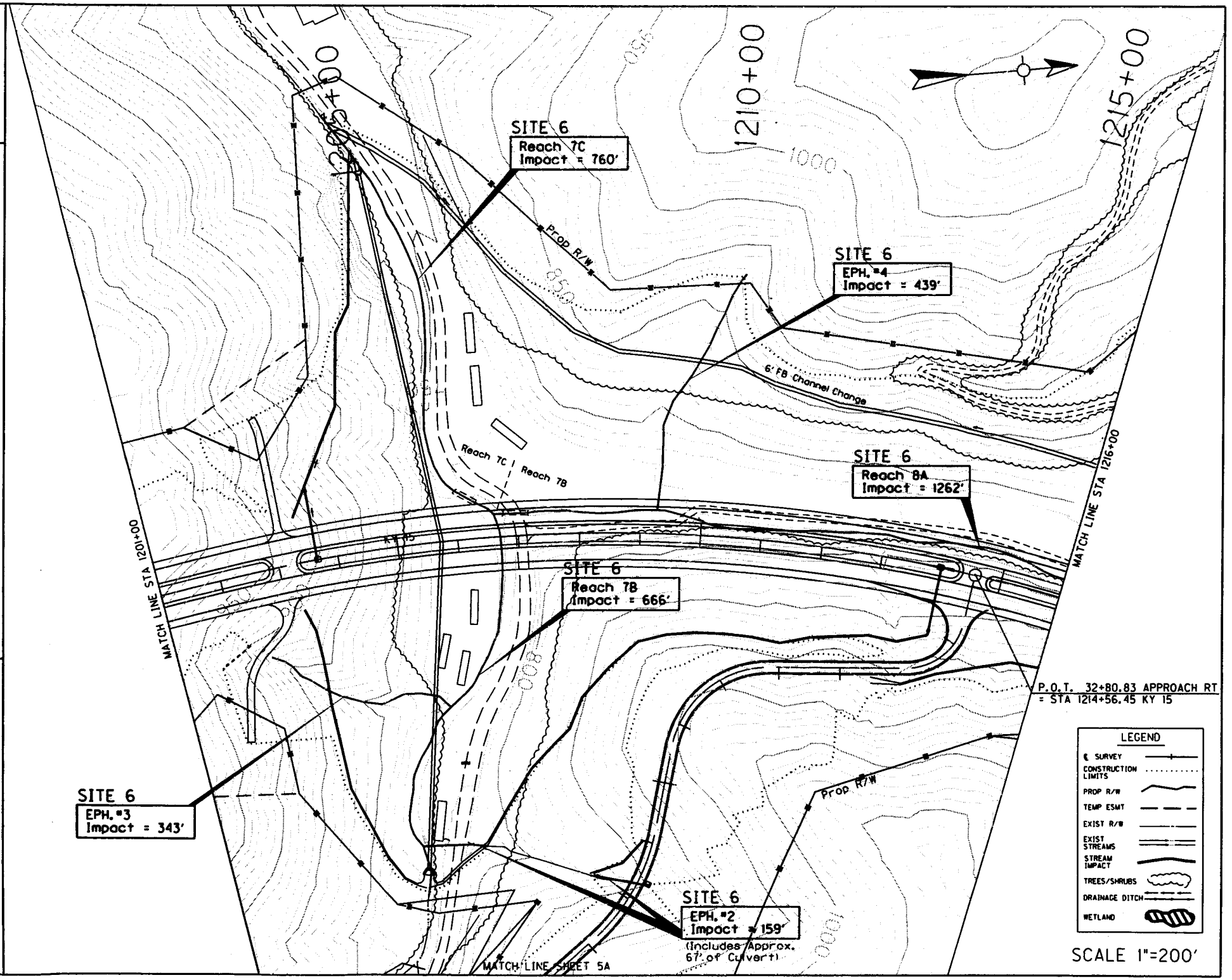
SCALE 1"=200'

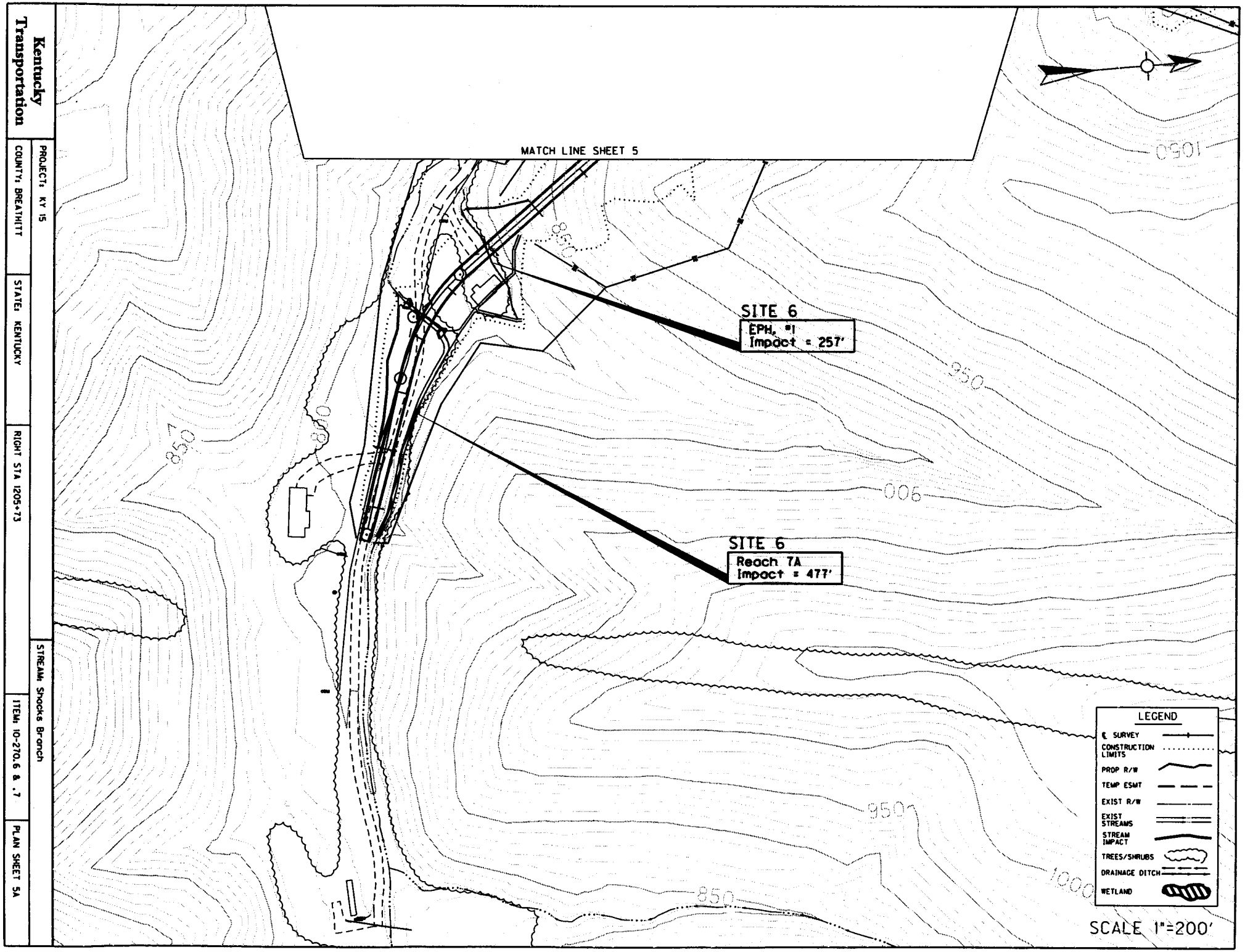


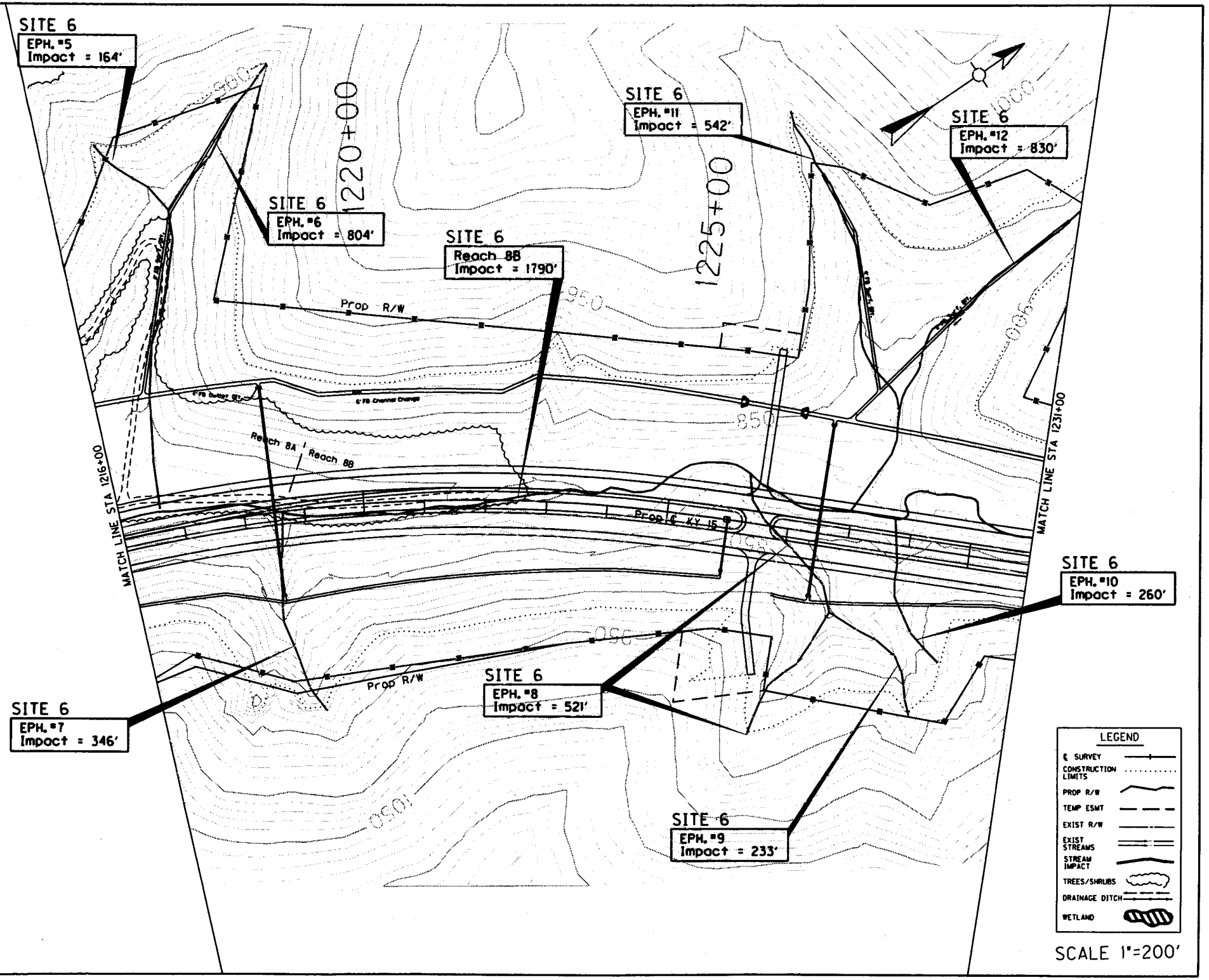
Kentucky Transportation	PROJECT: KY 15			STREAM: Tributary to N. F. Kentucky River	
	COUNTY: BREATHITT	STATE: KENTUCKY	STA 1176+00 to STA 1189+00	ITEM: 10-270.6 & .7	PLAN SHEET 3



Kentucky Transportation	PROJECT: KY 15			STREAM: Tributary to N. F. Kentucky River	
	COUNTY: BREATHITT	STATE: KENTUCKY	STA 1189+00 to STA 1201+00	ITEM: 10-270.6 & .7	PLAN SHEET 4


Kentucky Transportation
PROJECT: KY 15
COUNTY: BREATHITT
STATE: KENTUCKY
STA 1201+00 to STA 1216+00
STREAM: Shocks Branch & UT's
ITEM: 10-270.6 & .7
PLAN SHEET 5
1205+00
1210+00
1215+00
1000
950
900
850
800
SITE 6
Reach 7C
Impact = 760'
SITE 6
EPH. #4
Impact = 439'
SITE 6
Reach 8A
Impact = 1262'
SITE 6
Reach 7B
Impact = 666'
SITE 6
EPH. #3
Impact = 343'
SITE 6
EPH. #2
Impact = 159'
(Includes Approx. 67' of Culvert)
Prop R/W
6' FB Channel Change
Reach 7C
Reach 7B
KY 15
MATCH LINE STA 1201+00
MATCH LINE STA 1216+00
MATCH LINE SHEET 5A
P.O.T. 32+80.83 APPROACH RT
= STA 1214+56.45 KY 15
LEGEND
℄ SURVEY
CONSTRUCTION LIMITS
PROP R/W
TEMP ESMT
EXIST R/W
EXIST STREAMS
STREAM IMPACT
TREES/SHRUBS
DRAINAGE DITCH
WETLAND
SCALE 1"=200'


Kentucky Transportation
PROJECT: KY 15
COUNTY: BREATHITT
STATE: KENTUCKY
RIGHT STA 1205+73
STREAM: Shocks Branch
ITEM: 10-270.6 & .7
PLAN SHEET 5A
MATCH LINE SHEET 5
SITE 6
EPH, #1
Impact = 257'
SITE 6
Reach 7A
Impact = 477'
LEGEND
℄ SURVEY
CONSTRUCTION LIMITS
PROP R/W
TEMP ESMT
EXIST R/W
EXIST STREAMS
STREAM IMPACT
TREES/SHRUBS
DRAINAGE DITCH
WETLAND
SCALE 1"=200'



Kentucky Transportation

PROJECT: KY 15

COUNTY: BREATHITT

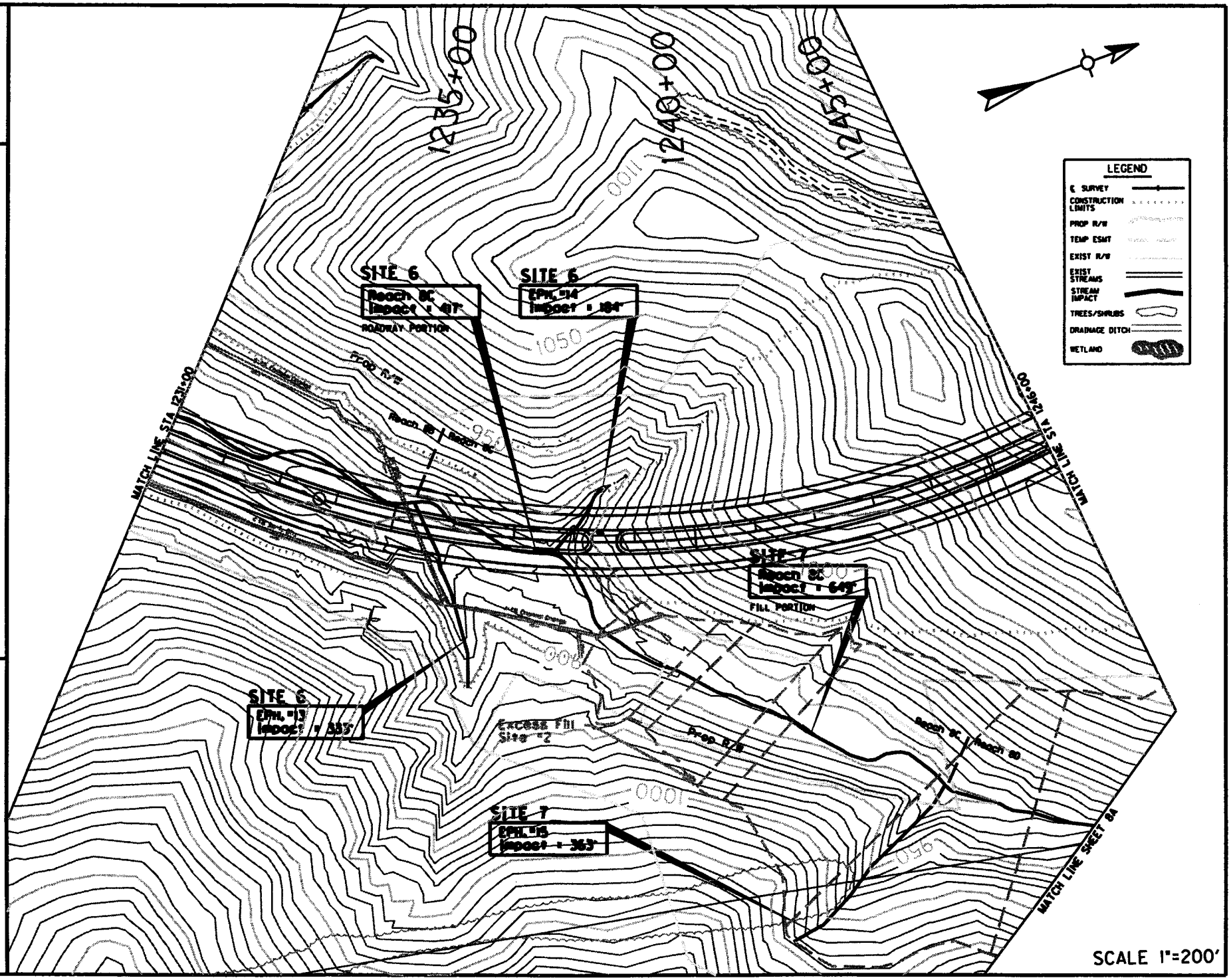
STATE: KENTUCKY

STA 1216+00 to STA 1231+00

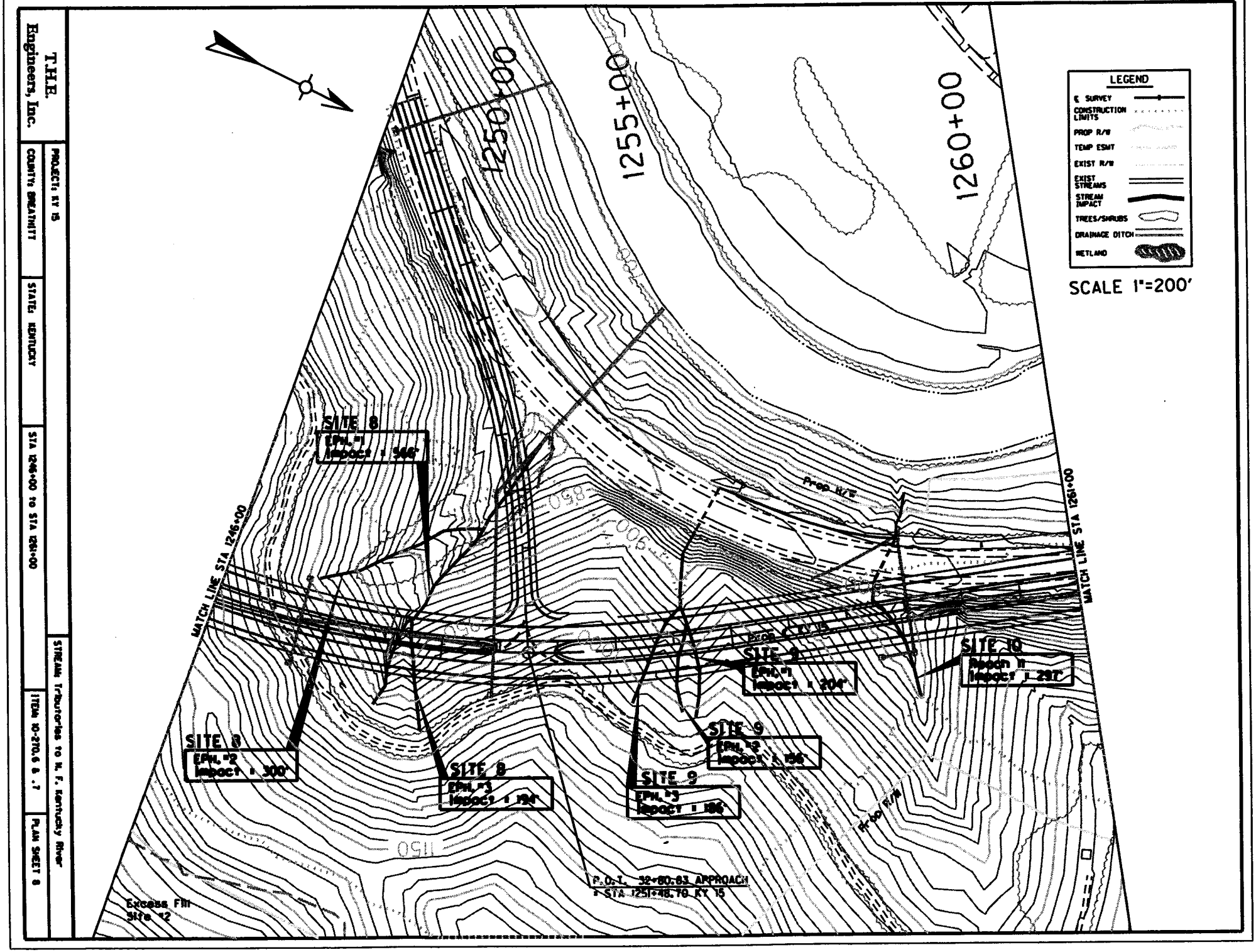
STREAM: Tributary to Shacks Branch

ITEM: 10-270.6 & .7

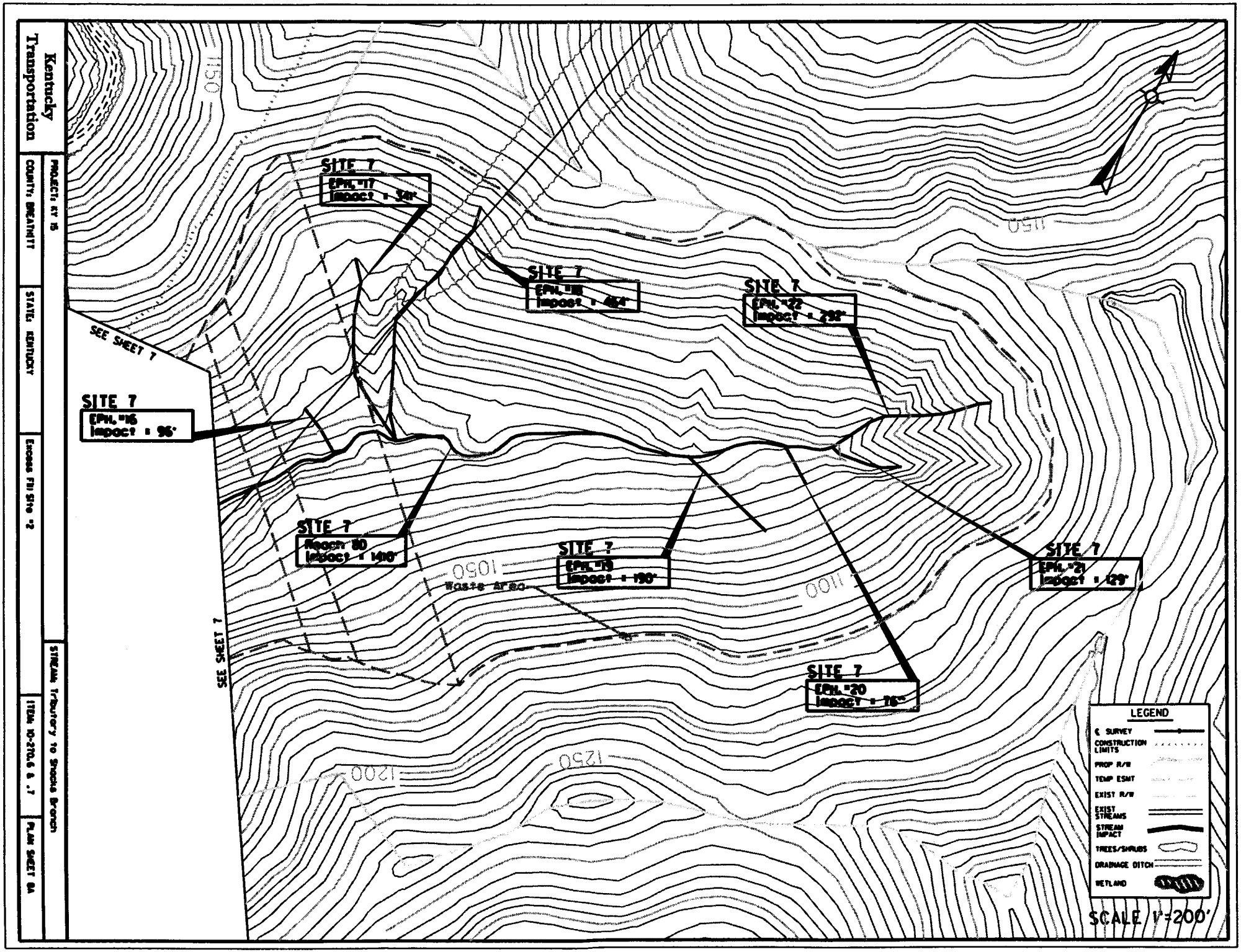
PLAN SHEET 6



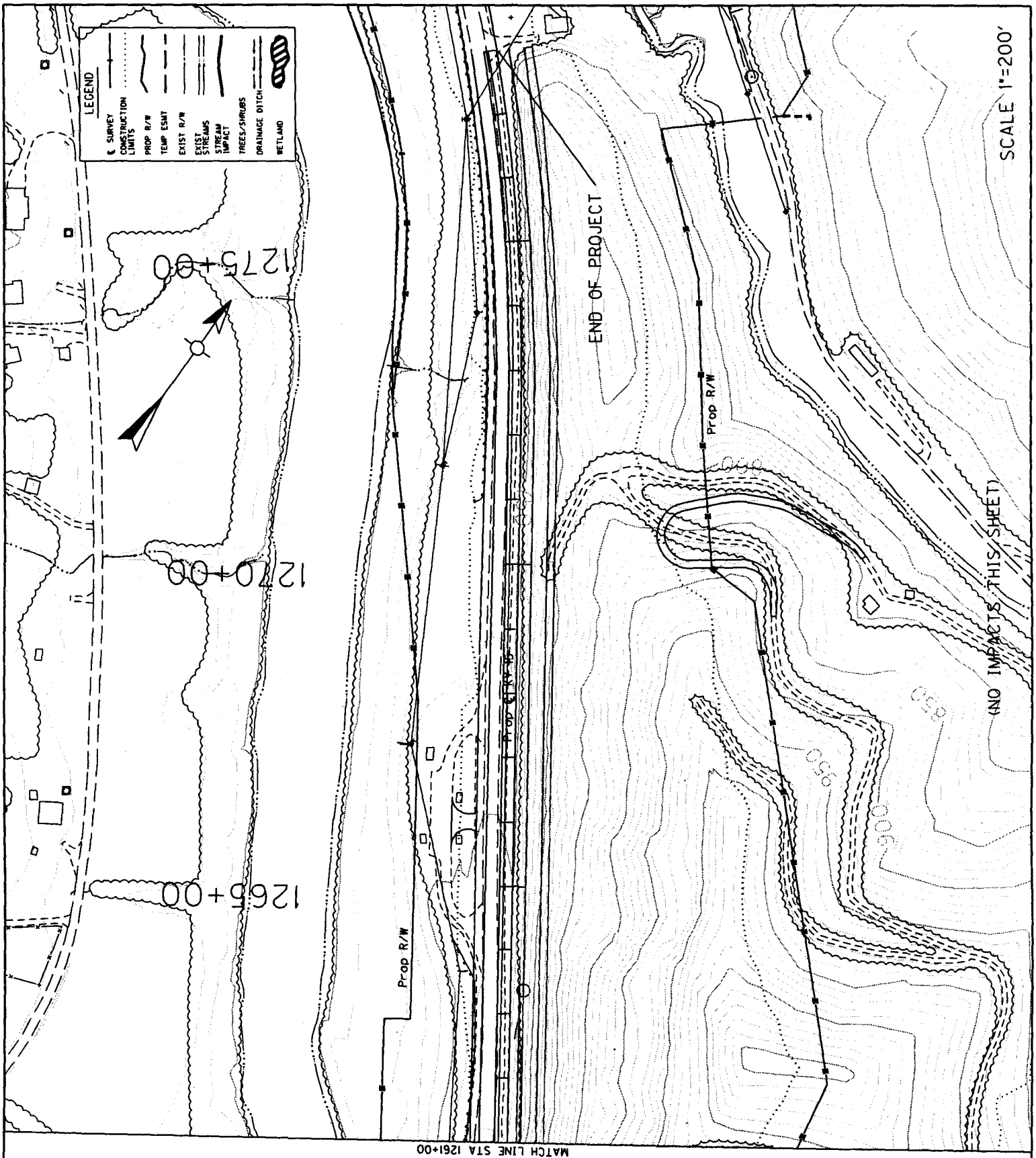
plan7.dgn 5/14/2007 1:05:55 PM



plan8.dgn 5/14/2007 1:09:56 PM



plan8a.dgn 5/14/2007 1:10:50 PM



Kentucky Transportation	PROJECT: KY 15			STREAM: North Fork Kentucky River	
	COUNTY: BREATHITT	STATE: KENTUCKY	STA 1261+00 to End of Project	ITEM: 10-270.6 & .7	PLAN SHEET 9

Kentucky Transportation

PROJECT: KY 15

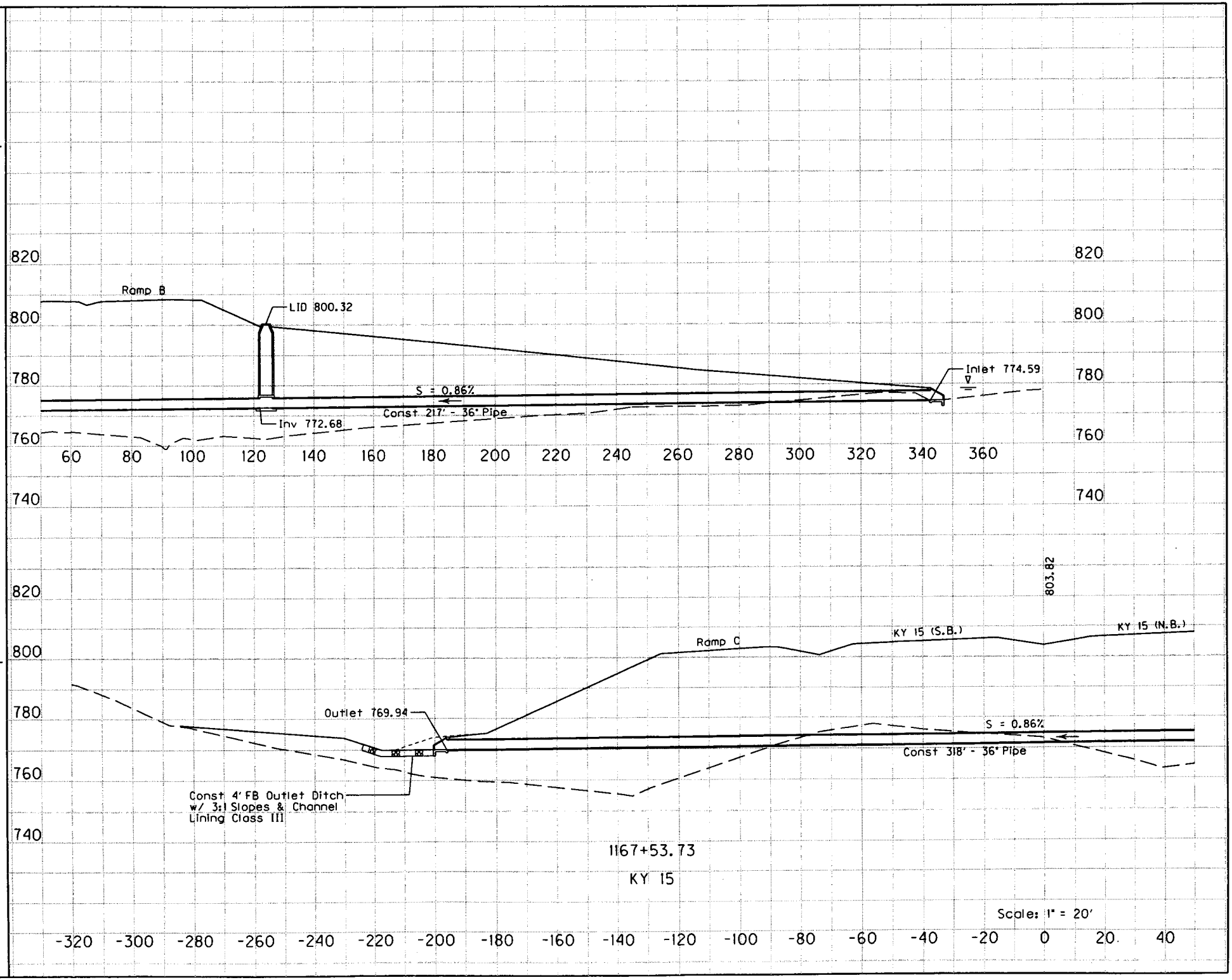
COUNTY: BREATHITT

STATE: KENTUCKY

STA 1167+53.7

ITEM: 10-270.6 & .7

PIPE SHEET 10



Kentucky Transportation

PROJECT: KY 15

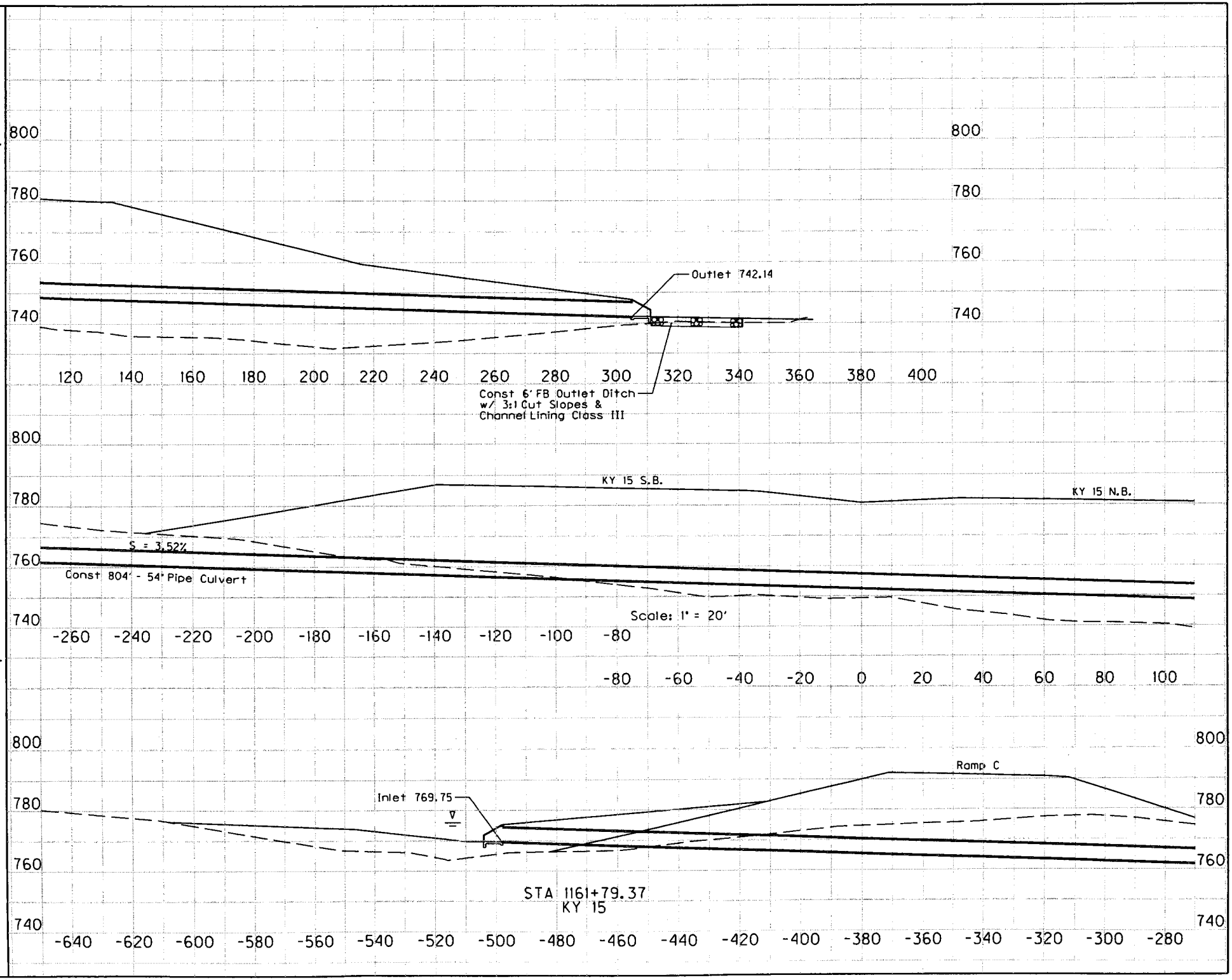
COUNTY: BREATHITT

STATE: KENTUCKY

STA 1161+79.37

ITEM: 10-270.6 & .7

PIPE SHEET 11



Kentucky Transportation

PROJECT: KY 15

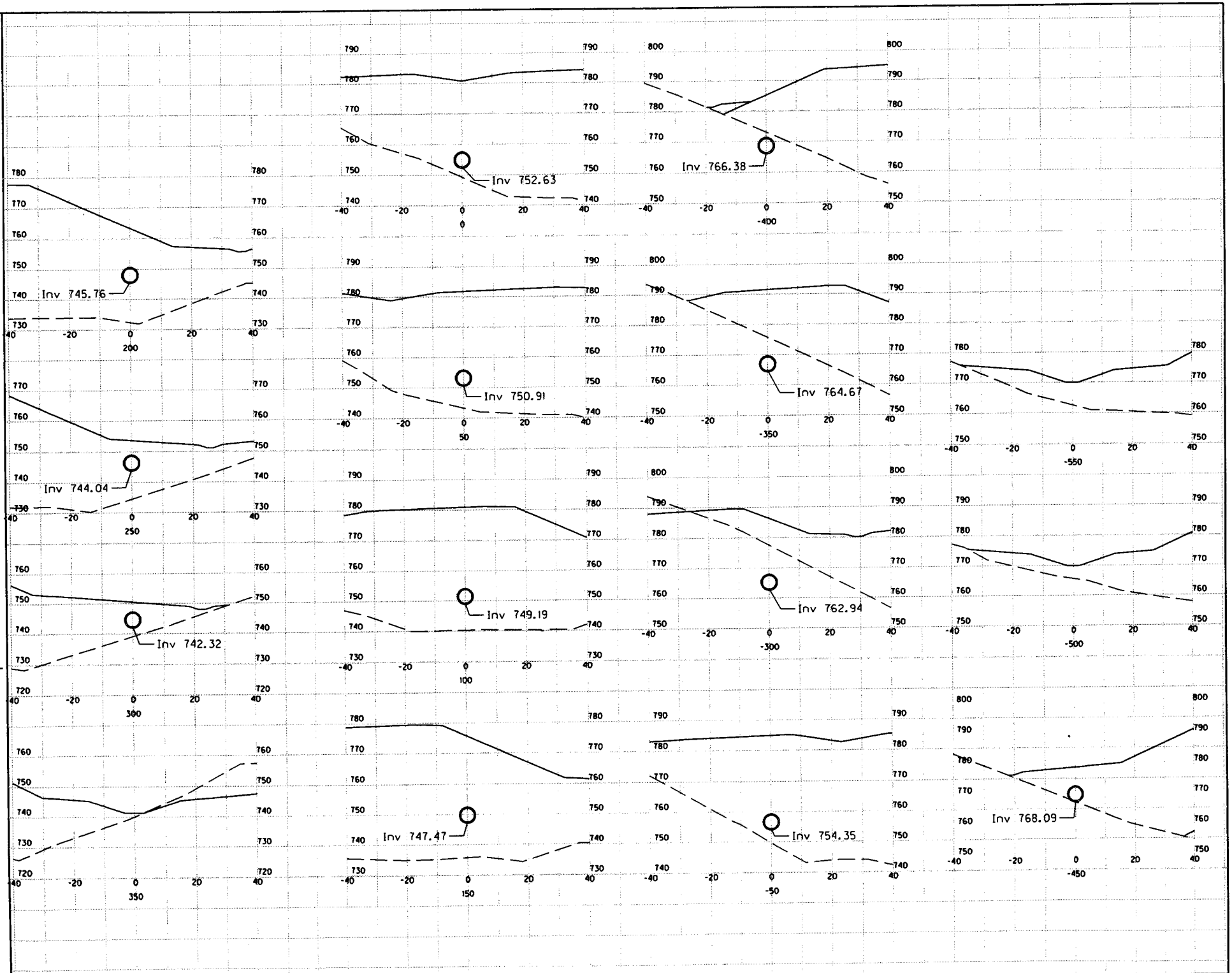
COUNTY: BREATHITT

STATE: KENTUCKY

STA 1161+79.37 (Continued)

ITEM: 10-270.6 & .7

PIPE SHEET 12



Kentucky Transportation

PROJECT: KY 15

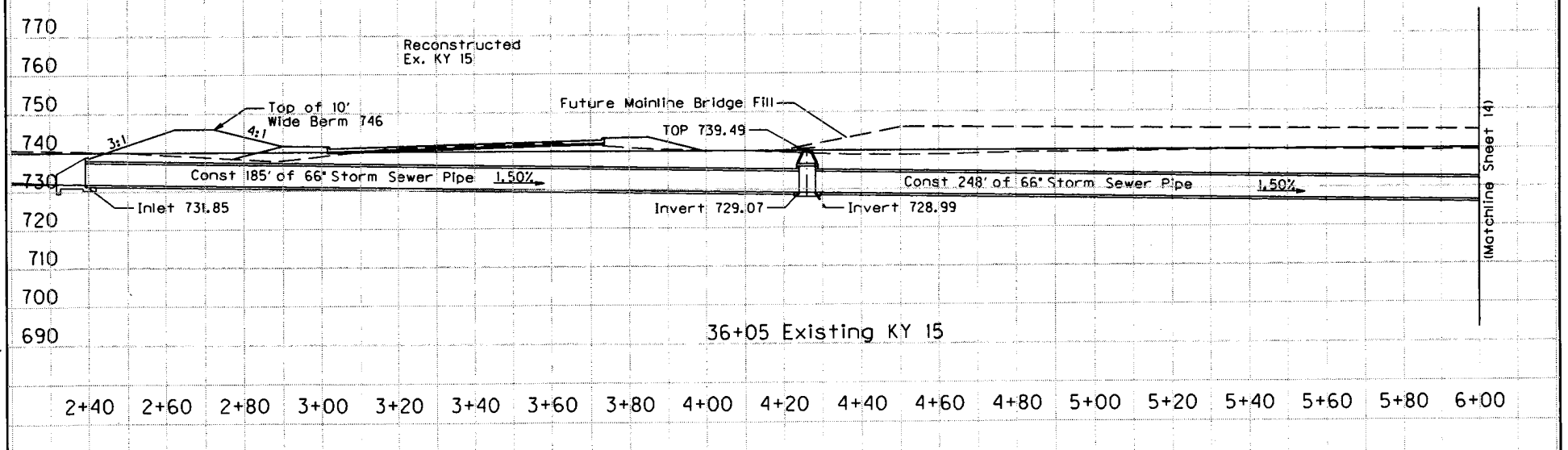
COUNTY: BREATHITT

STATE: KENTUCKY

STA 36+05 (EXISTING KY 15)

ITEM: 10-270.6 & .7

PIPE SHEET 13



SCALE: 1"=40'

Kentucky Transportation

PROJECT: KY 15

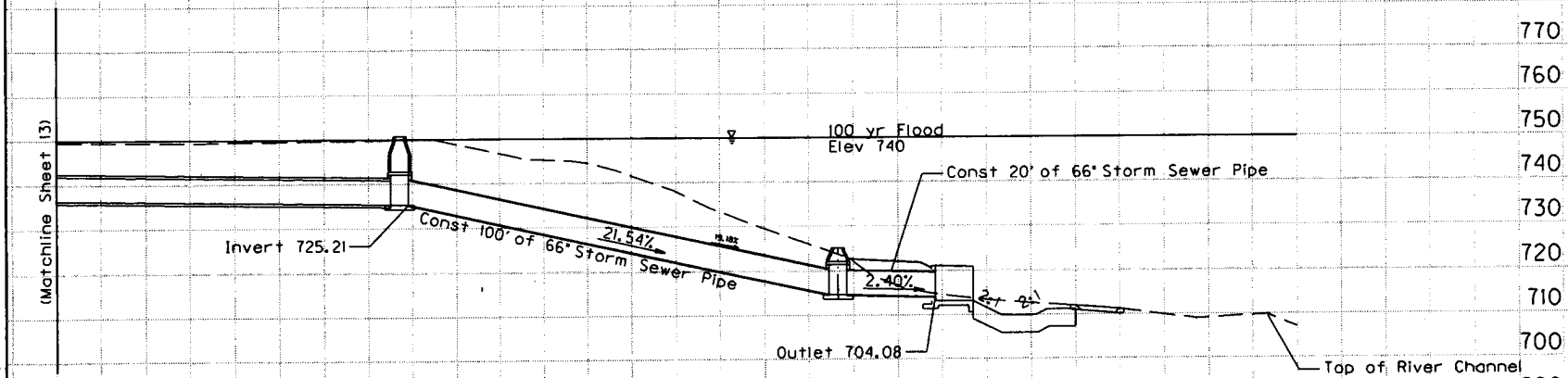
COUNTY: BREATHITT

STATE: KENTUCKY

STA 36+05 (EXISTING KY 15)

ITEM: 10-270.6 & .7

PIPE SHEET 14



36+05 Existing KY 15

6+00 6+20 6+40 6+60 6+80 7+00 7+20 7+40 7+60 7+80 8+00 8+20 8+40 8+60

SCALE: 1"=40'

Kentucky Transportation

PROJECT: KY 15

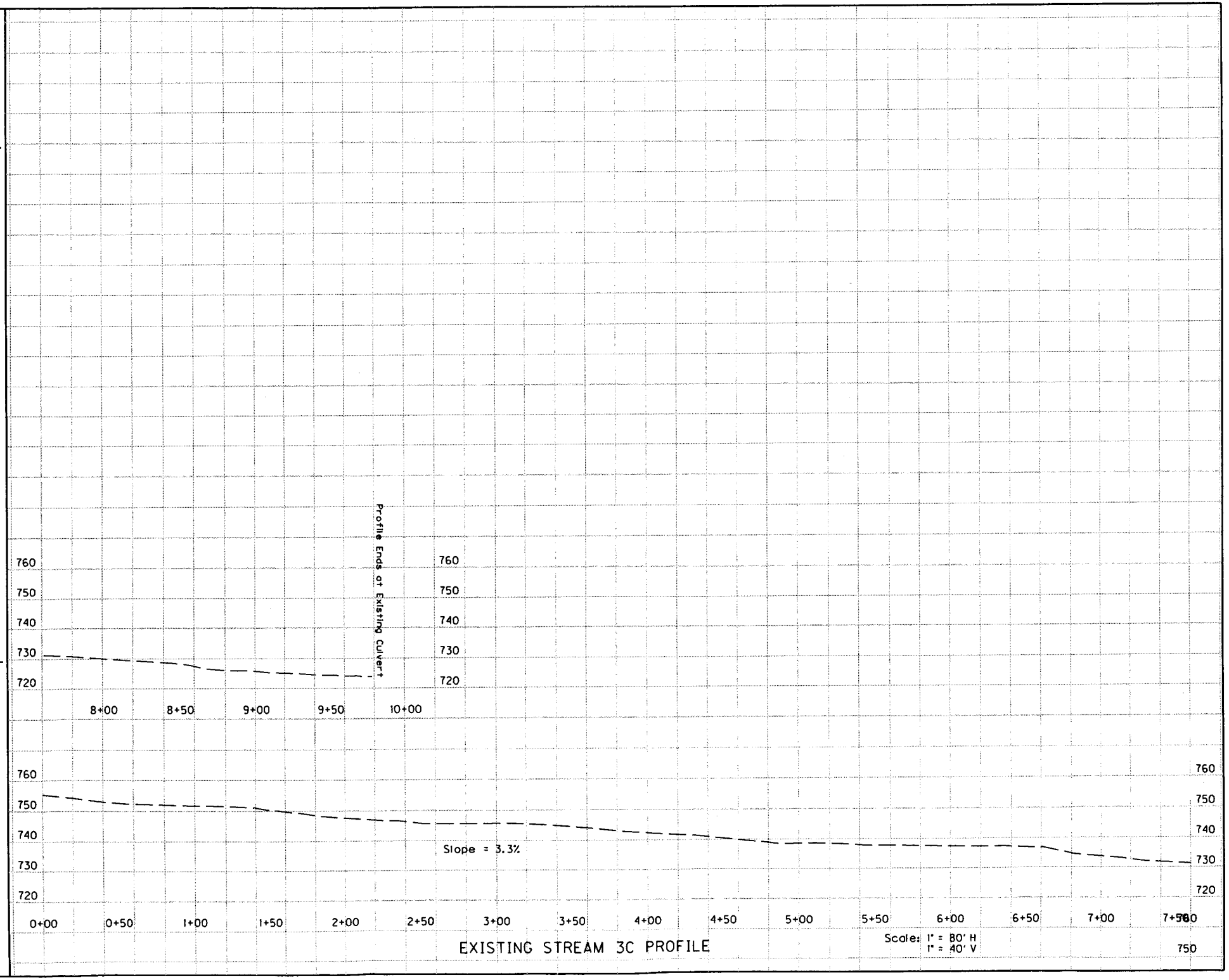
COUNTY: BREATHITT

STATE: KENTUCKY

STREAM 3C PROFILE

ITEM: 10-270.6 & .7

PIPE SHEET 15



EXISTING STREAM 3C PROFILE

Scale: 1" = 80' H
1" = 40' V

Kentucky Transportation

PROJECT: KY 15

COUNTY: BREATHITT | STATE: KENTUCKY | STA 20+61.30 (Brewer Road) | ITEM: 10-270.6 & .7 | PIPE SHEET 16

Kentucky Transportation

PROJECT: KY 15

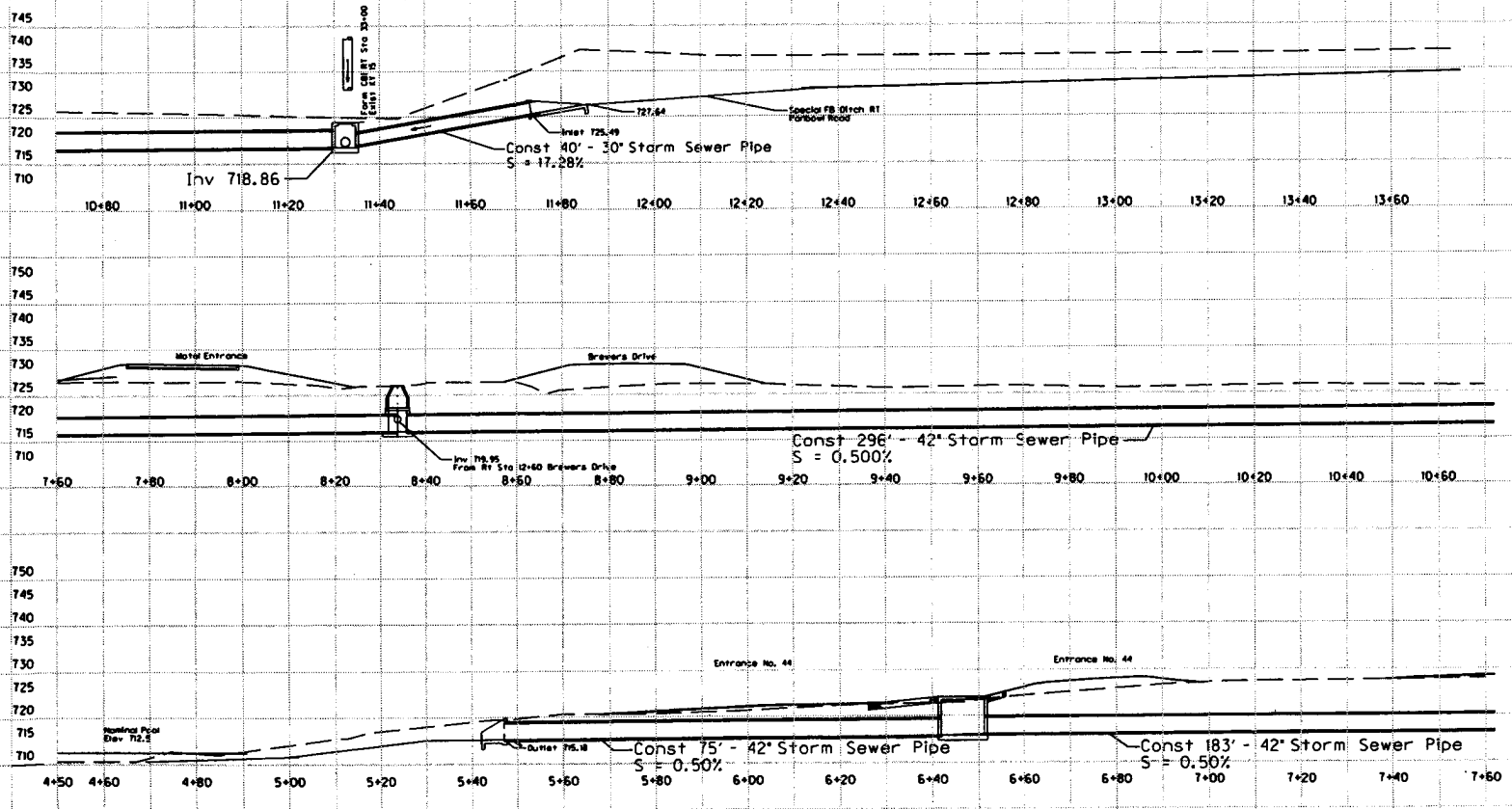
COUNTY: BREATHITT

STATE: KENTUCKY

STA 27+77.62 to 33+00 (Panbowl Road)

ITEM: 10-270.6 & .7

PIPE SHEET 17



PIPE SECTION

STA 27+77.62 to 33+00
PANBOWL ROAD

SCALE: 1"=40'

Kentucky Transportation

PROJECT: KY 15

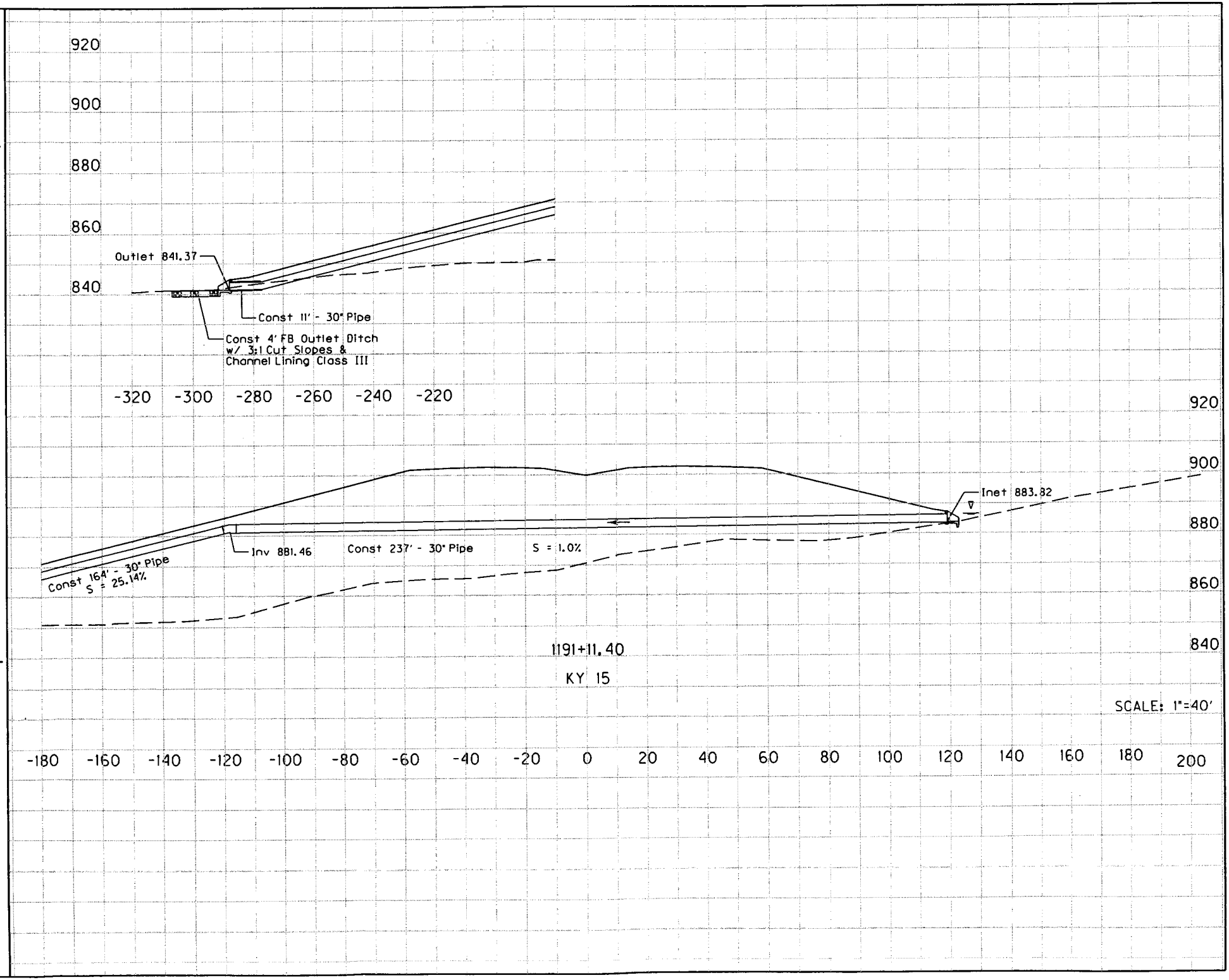
COUNTY: BREATHITT

STATE: KENTUCKY

STA 1191+40

ITEM: 10-270.6 & .7

PIPE SHEET 18



Kentucky Transportation

PROJECT: KY 15

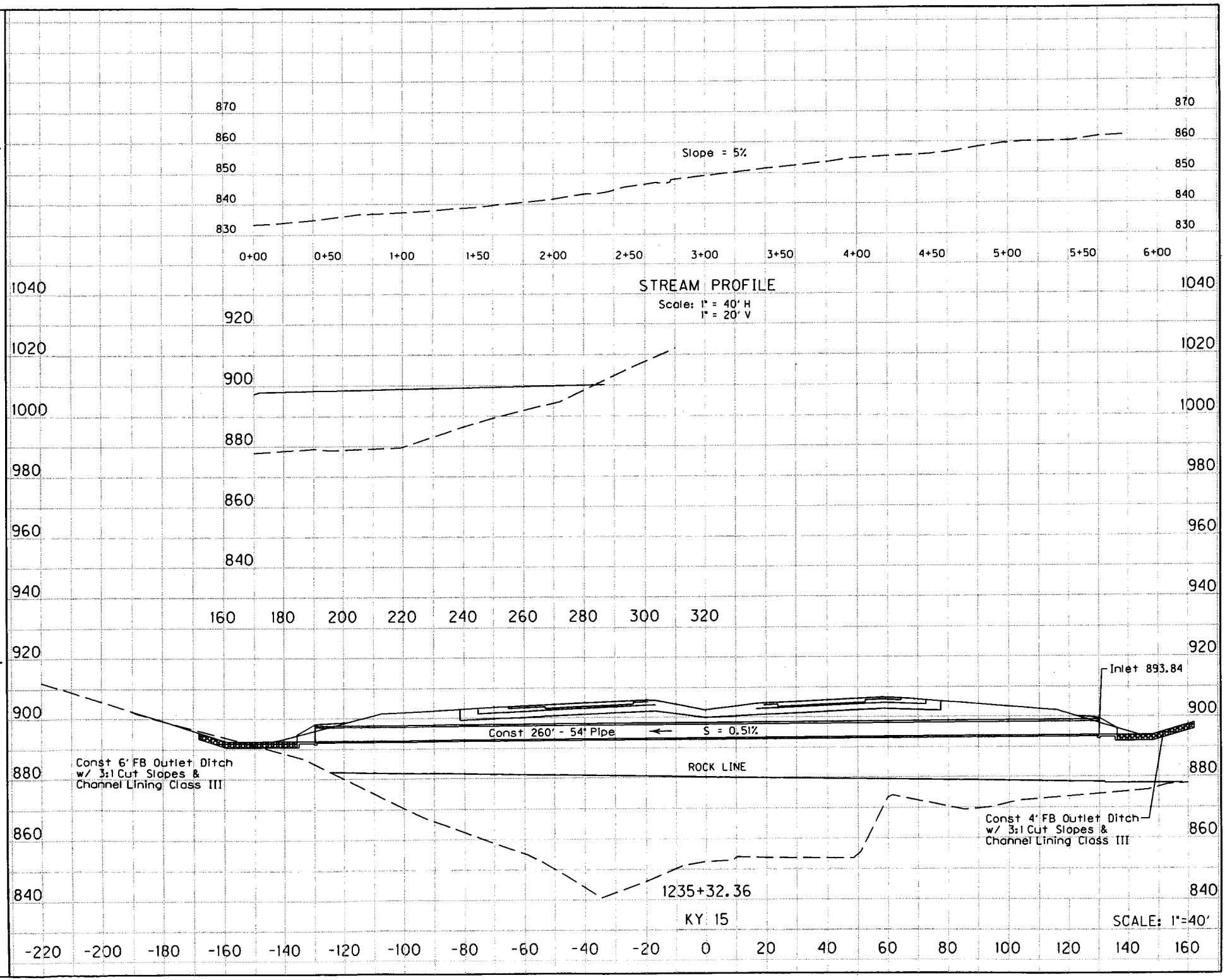
COUNTY: BREATHITT

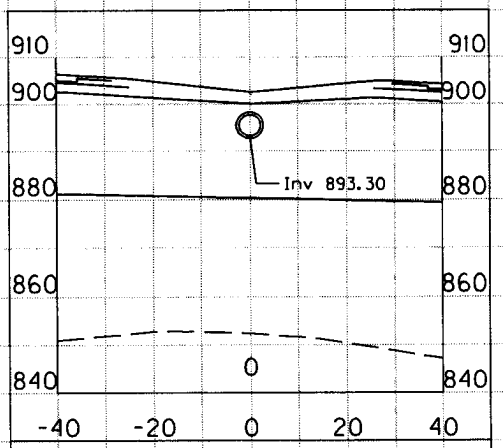
STATE: KENTUCKY

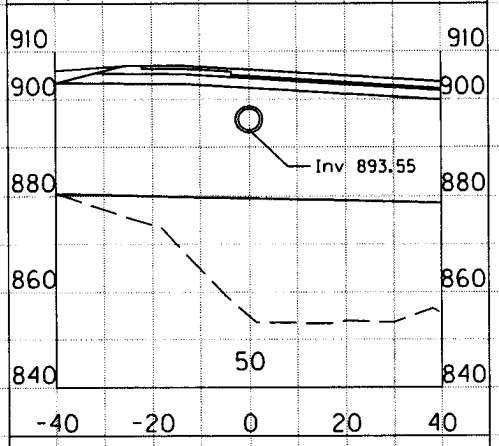
STA 1235+32.36

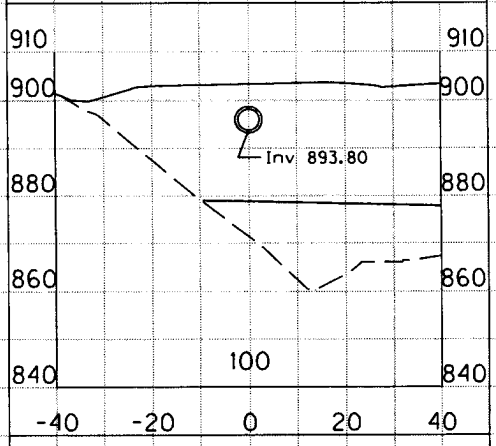
ITEM: 10-270.6 & .7

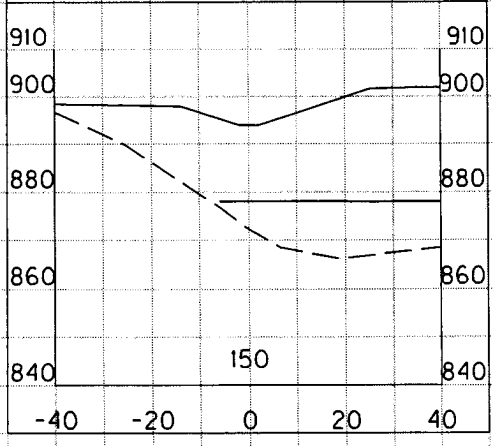
PIPE SHEET 19

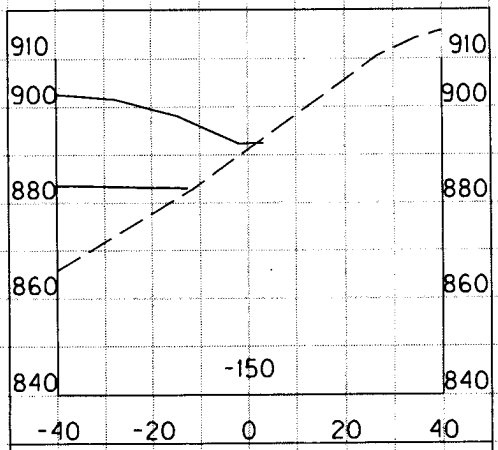


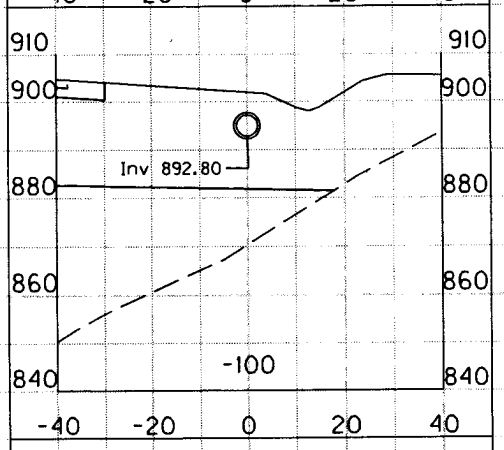


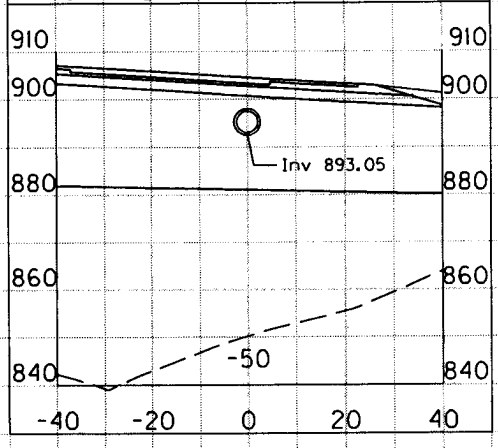












CHANNEL SECTIONS

SCALE: 1"=40'

Kentucky Transportation	PROJECT: KY 15				
	COUNTY: BREATHITT	STATE: KENTUCKY	STA 1235+32.36 (continued)	ITEM: 10-270.6 & .7	PIPE SHEET 20

Kentucky Transportation

PROJECT: KY 15

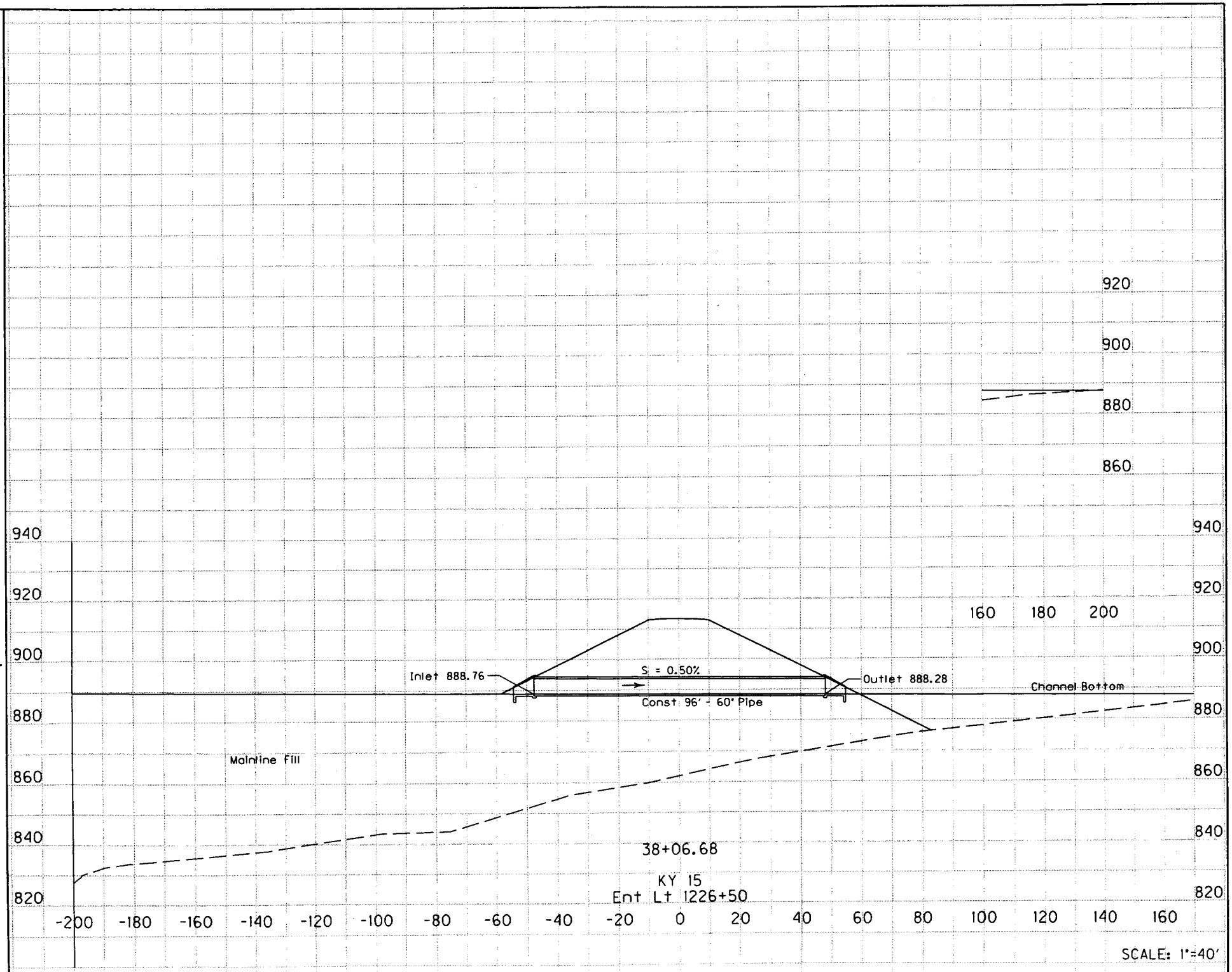
COUNTY: BREATHITT

STATE: KENTUCKY

STA 38+06.68 (Entrance Road), Left Sta. 1226+50

ITEM: 10-270.6 & .7

PIPE SHEET 21



Kentucky Transportation

PROJECT: KY 15

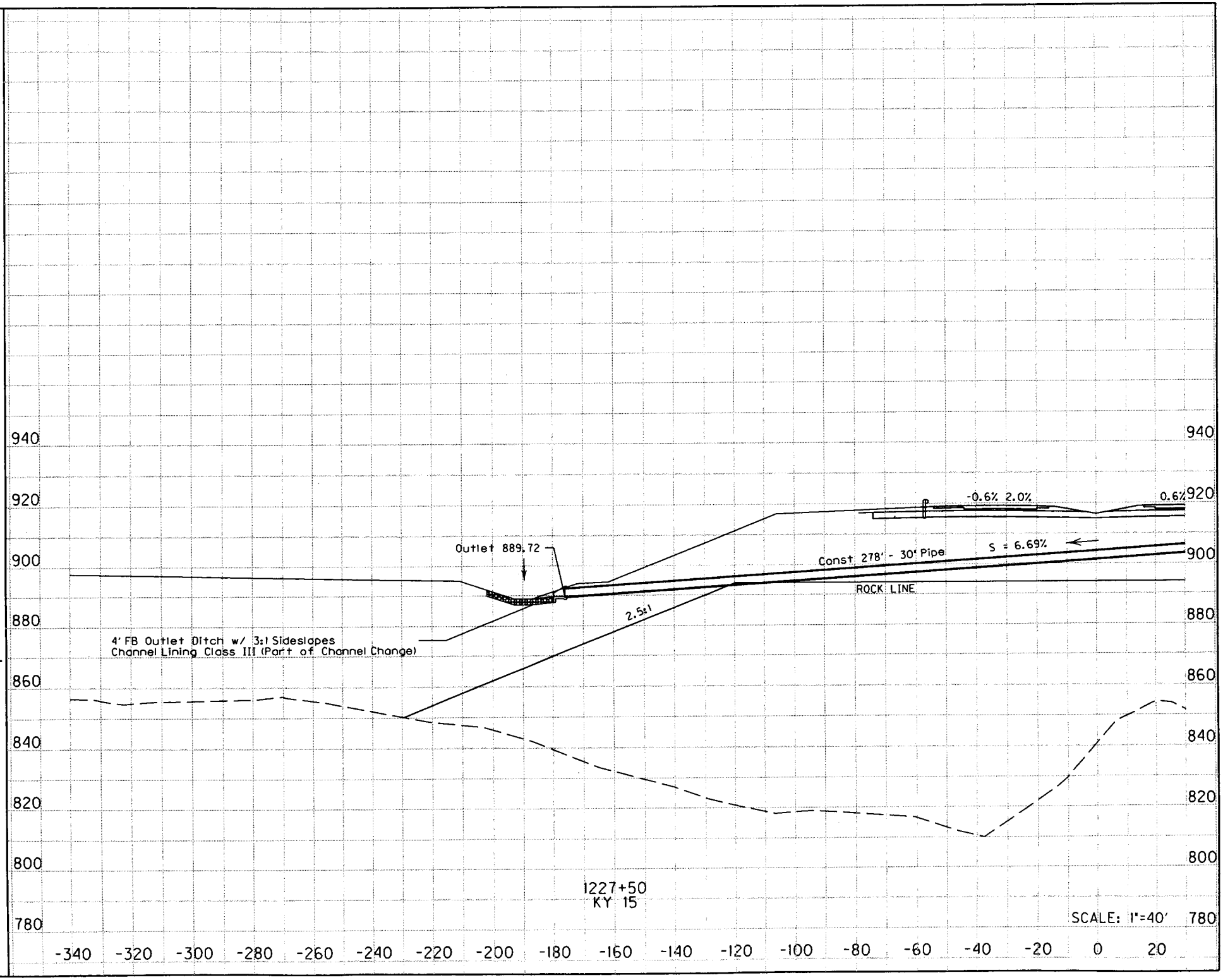
COUNTY: BREATHITT

STATE: KENTUCKY

STA 1227+50

ITEM: 10-270.6 & .7

PIPE SHEET 22



Kentucky Transportation

PROJECT: KY 15

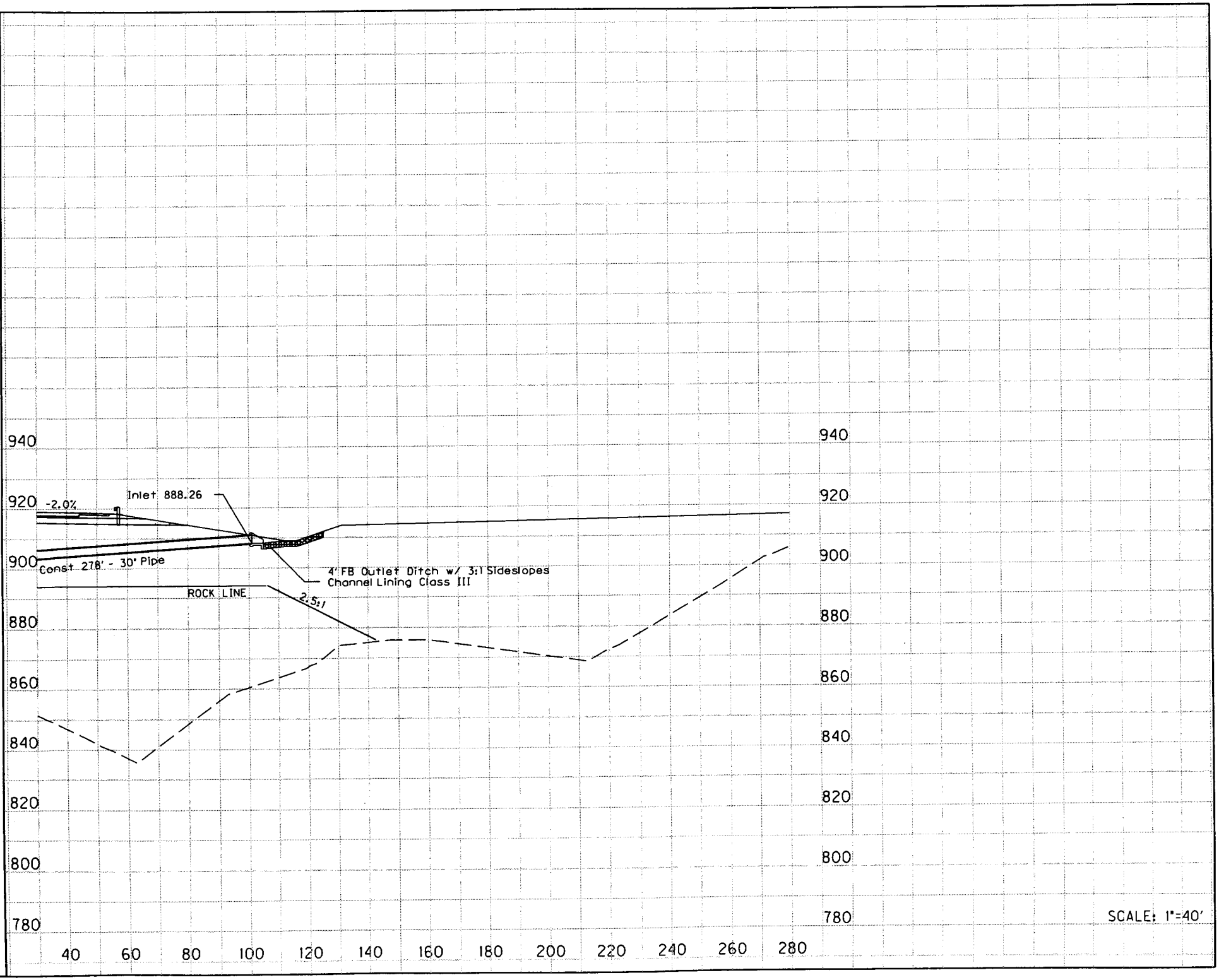
COUNTY: BREATHITT

STATE: KENTUCKY

STA 1227+50 (continued)

ITEM: 10-270.6 & .7

PIPE SHEET 23



Kentucky Transportation

PROJECT: KY 15

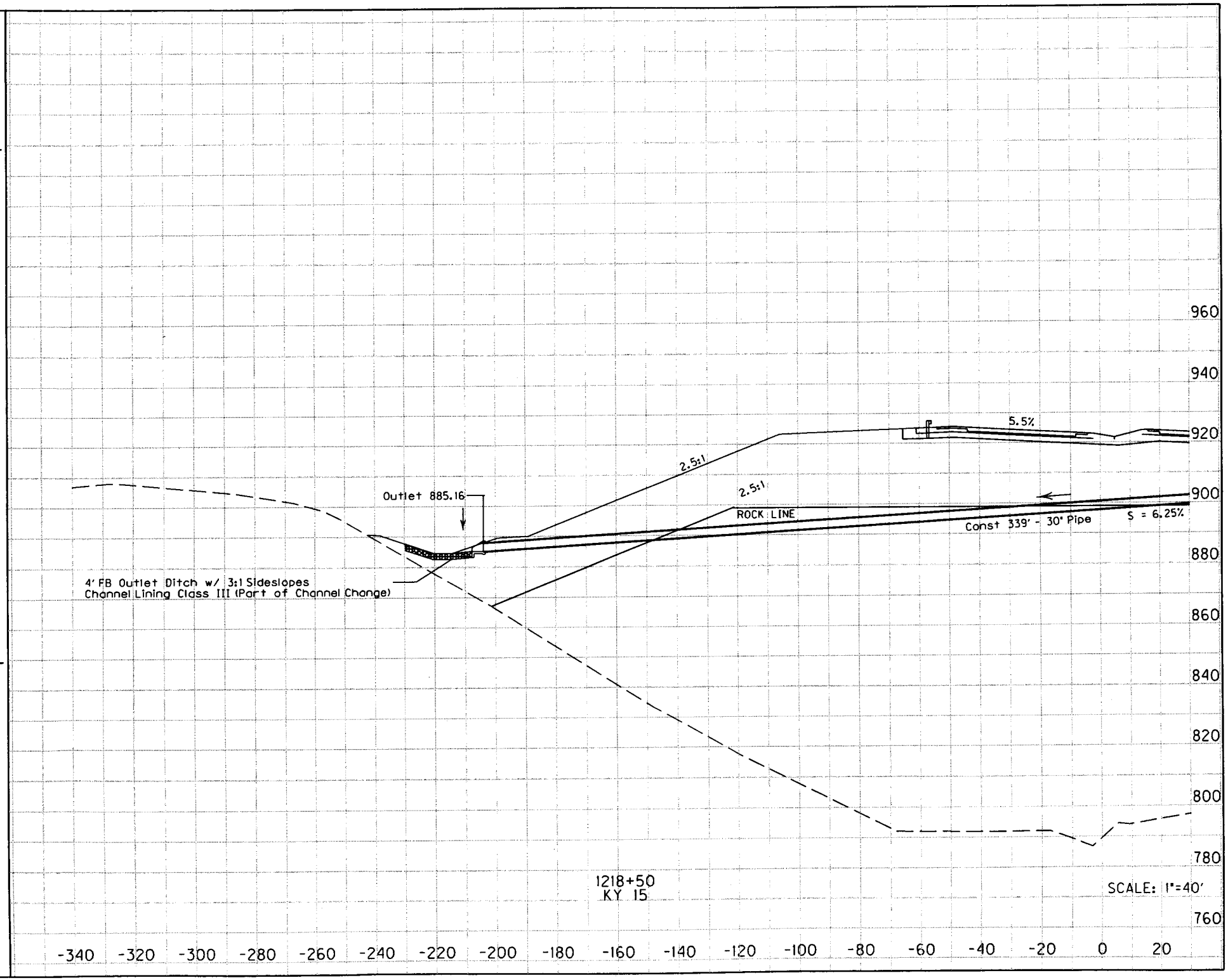
COUNTY: BREATHITT

STATE: KENTUCKY

STA 1218+50

ITEM: 10-270.6 & .7

PIPE SHEET 24



Kentucky Transportation

PROJECT: KY 15

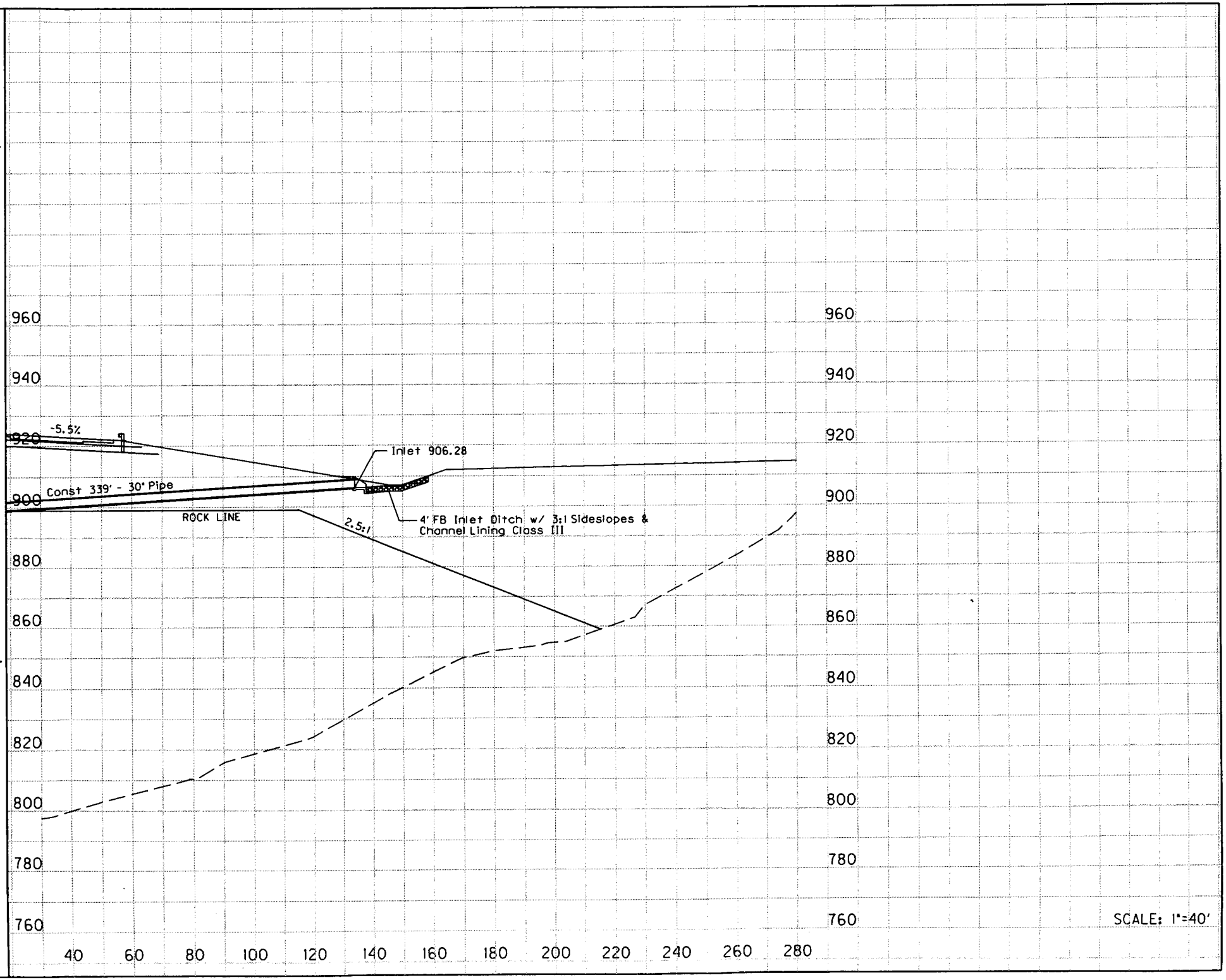
COUNTY: BREATHITT

STATE: KENTUCKY

STA 1218+50 (continued)

ITEM: 10-270.6 & .7

PIPE SHEET 25



Kentucky Transportation

PROJECT: KY 15

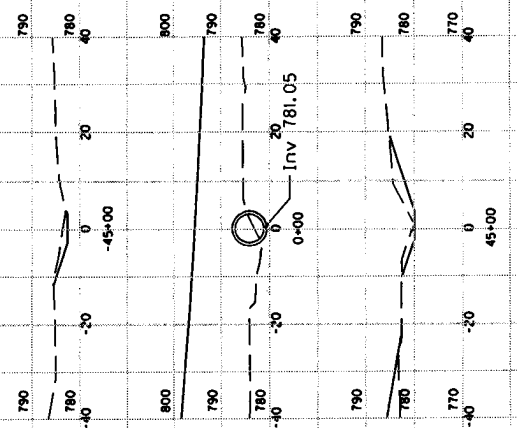
COUNTY: BREATHITT

STATE: KENTUCKY

STA 47+66.23 (Shacks Branch)

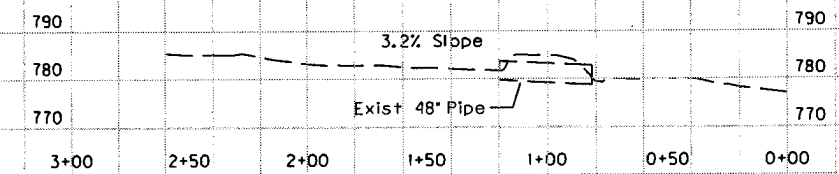
ITEM: 10-270.6 & .7

PIPE SHEET 26



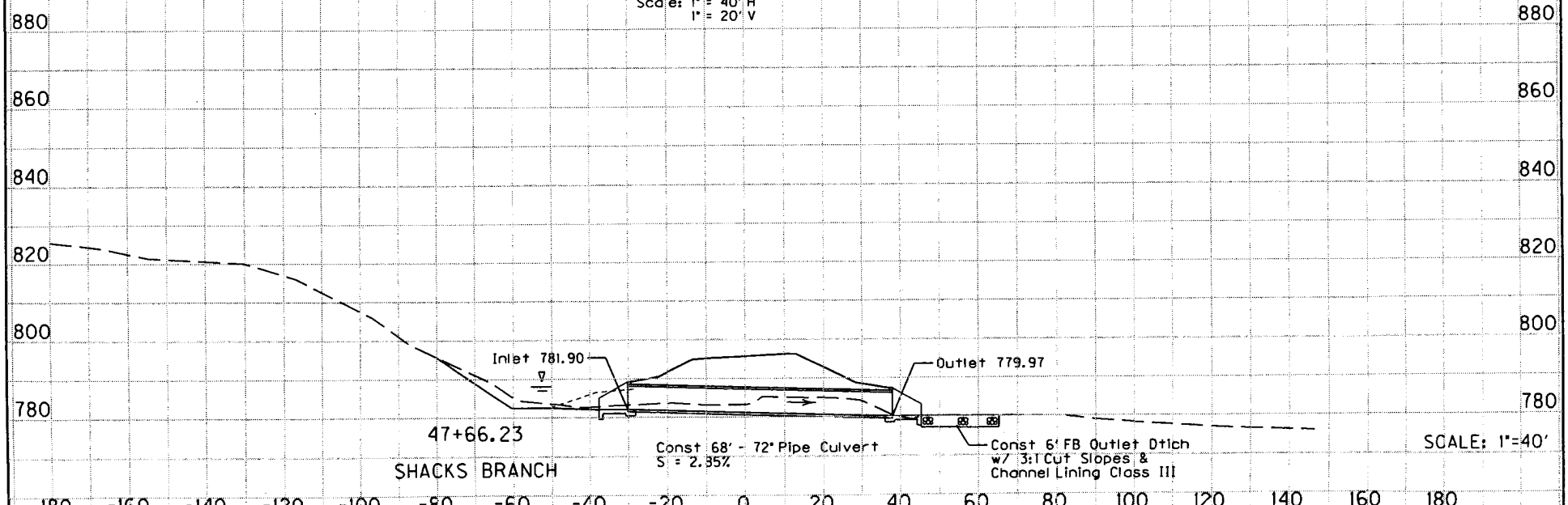
CHANNEL SECTIONS

Scale : 1" = 20'



STREAM PROFILE

Scale: 1" = 40' H
1" = 20' V



Kentucky Transportation

PROJECT: KY 15

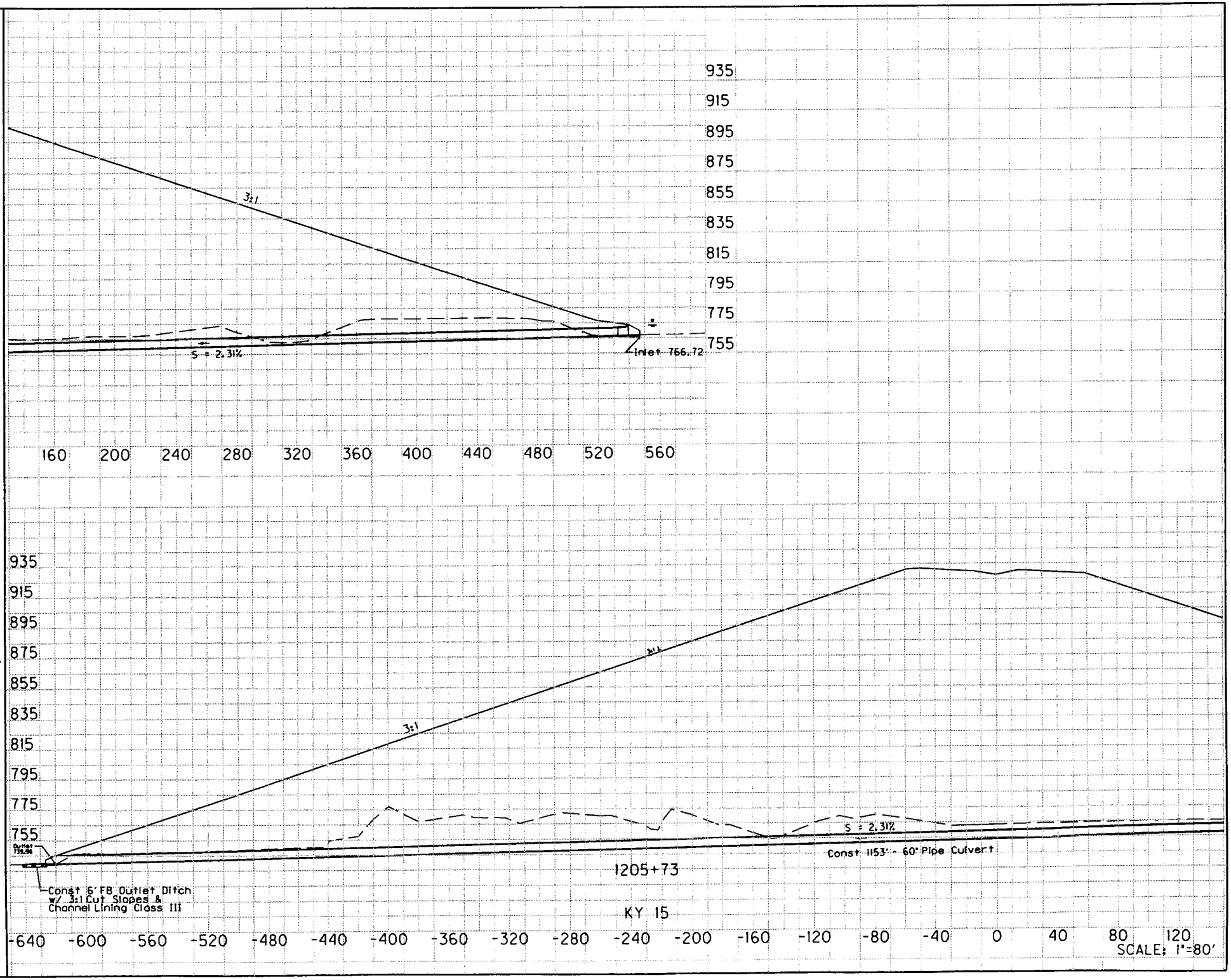
COUNTY: BREATHITT

STATE: KENTUCKY

STA 1205+73

ITEM: 10-270.6 & .7

PIPE SHEET 27



Kentucky Transportation

PROJECT: KY 15

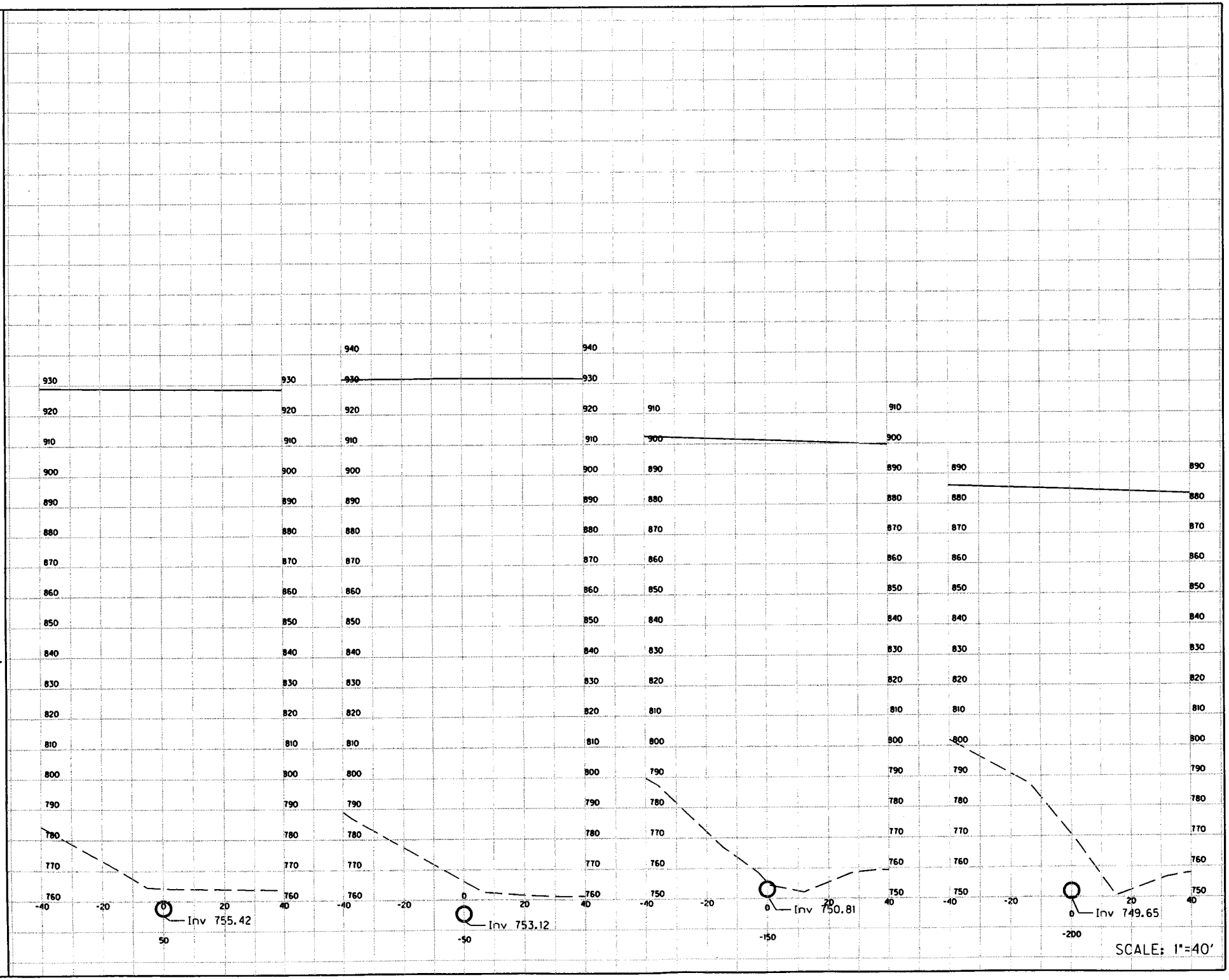
COUNTY: BREATHITT

STATE: KENTUCKY

STA 1205+73 (Continued)

ITEM: 10-270.6 & .7

PIPE SHEET 28



Kentucky Transportation

PROJECT: KY 15

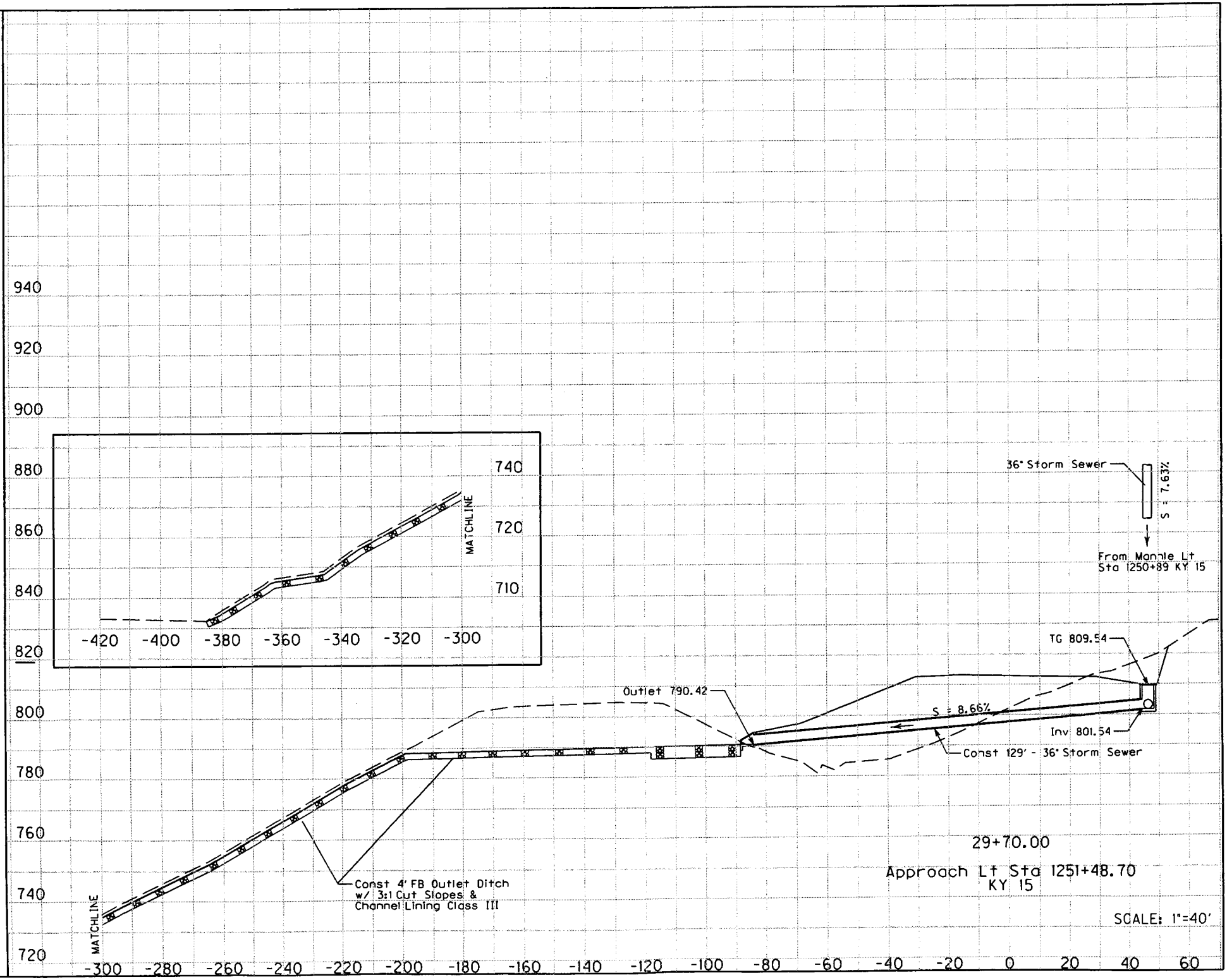
COUNTY: BREATHITT

STATE: KENTUCKY

STA 29+70.00 (Approach Road)

ITEM: 10-270.6 & .7

PIPE SHEET 29



29+70.00

Approach Lt Sta 1251+48.70
KY 15

SCALE: 1"=40'

Kentucky Transportation

PROJECT: KY 15

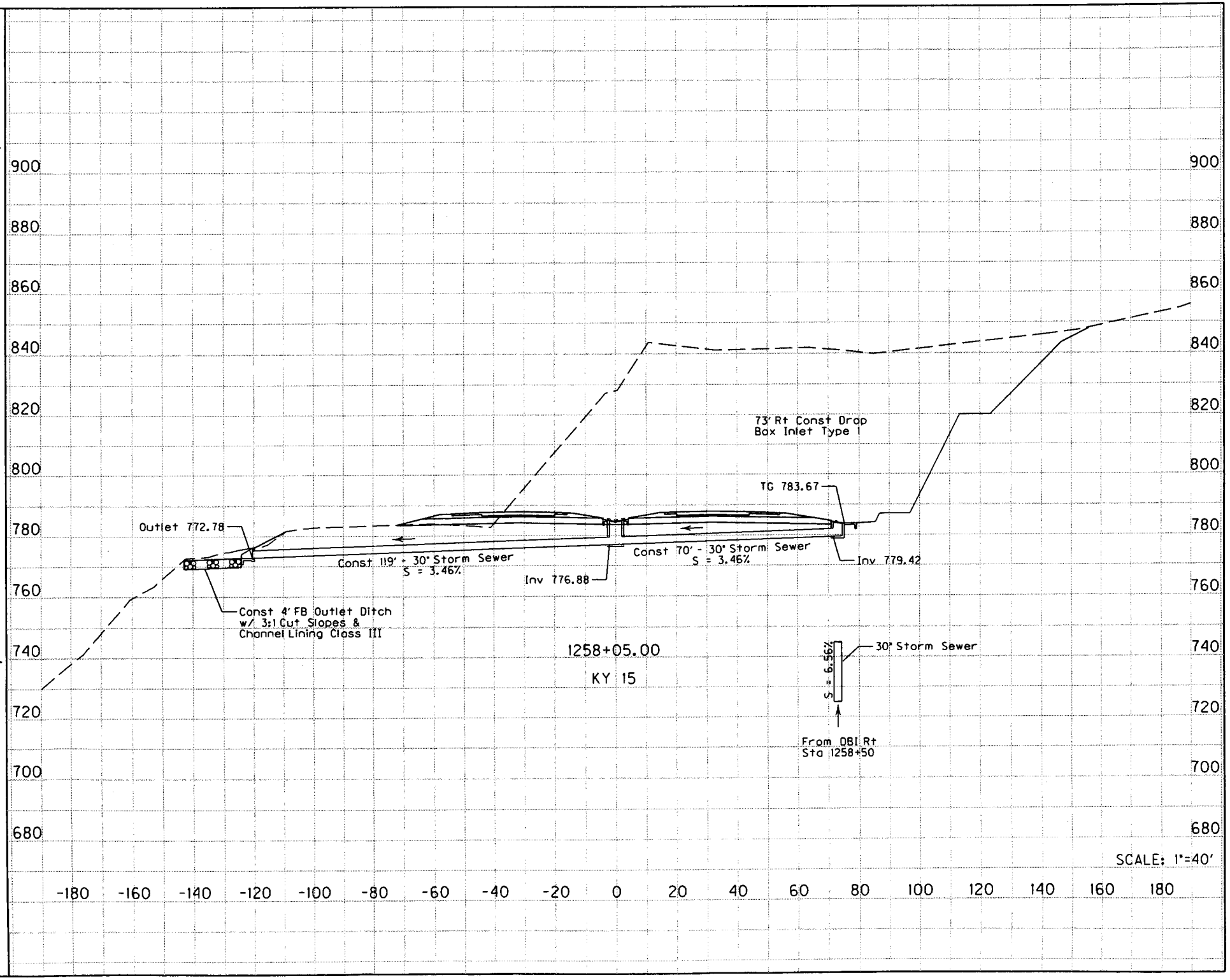
COUNTY: BREATHITT

STATE: KENTUCKY

STA 1258+05.00

ITEM: 10-270.6 & .7

PIPE SHEET 30



High Gradient Stream Data Sheet

STREAM NAME: - *Reach 2*			LOCATION: -
STATION:	DRAINAGE AREA (AC) -		BASIN/WATERSHED - *Kentucky River (North Fork KY River)*
LAT:	LONG:		COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: *-10/24/06*	TIME: : ☐ AM ☑PM		INVESTIGATORS; *- Rob Lewis, Julie Clark*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours	Has there been a heavy rain in the last 7 days?
☐	☐ Heavy rain	☐Yes ☑No
☐	☐ Steady rain	Air temperature *50* °C. Inches rainfall in past 24 hours *0* in
☐	☐ Intermittent showers	*85* % Cloud Cover
☑	☑Clear/sunny	

P-Chem: Temp (°C) *51* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *449* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width *3* ft
Range of Depth *0.1* ft
Average Velocity _____ ft/s
Discharge _____ cfs
Est. Reach Length _____

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☐ Forest
☐ Deep Mining	☑ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☑ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments ☐ Island ☐ Waterfalls ☐ Other ☑ Culverts

Stream Flow;
☐ Dry ☑ Pooled ☐ Low ☐ Normal ☑ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☑ Intermittent ☐ Ephemeral ☐ Seep

Riparian Vegetation: Dom. Tree/Shrub Taxa
Dominate Type:
☐ Trees ☑ Shrubs ☐ Grasses ☑ Herbaceous
Number of Strata *1*

Canopy Cover;
☐ Fully Exposed (0-25%)
☑ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☑ Channelization
(☑ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; _____ %	Pool *100* %
Silt/Clay (<0.06 mm)			100
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 93

NOTES/COMMENTS; Pond inlet channel from Brewers Rd.

High Gradient Stream Data Sheet

STREAM NAME: - *Reach 3B*			LOCATION: -
STATION:	DRAINAGE AREA (AC) -		BASIN/WATERSHED - *Kentucky River (North Fork KY River)*
LAT:	LONG:		COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: *-10/24/06*	TIME: : ☐ AM ☑PM		INVESTIGATORS; *- Rob Lewis, Julie Clark*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours	Has there been a heavy rain in the last 7 days?
☐	☐ Heavy rain	☐Yes ☑No
☐	☐ Steady rain	Air temperature *50* °F. Inches rainfall in past 24 hours *0* in
☐	☐ Intermittent showers	*50* % Cloud Cover
☑	☑Clear/sunny	

P-Chem: Temp (°F) *53* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *115* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width	*2.5*	ft
Range of Depth	*0 – 0.2*	ft
Average Velocity		ft/s
Discharge		cfs
Est. Reach Length		

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments ☐ Island ☐ Waterfalls ☐ Other ☐ Culverts

Stream Flow;
☐ Dry ☐ Pooled ☐ Low ☑ Normal ☐ High ☐ Very Rapid or Torrential

Stream Type;
☑ Perennial ☐ Intermittent ☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs ☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Dogwood
Sugar Maple
Sycamore

Canopy Cover;
☐ Fully Exposed (0-25%)
☑ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☐ Channelization (☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle *30* %	Run; *30* %	Pool *40* %
Silt/Clay (<0.06 mm)	60	60	60
Sand (0.06-2 mm)			
Gravel (2-64 mm)	30	30	30
Cobble (64-256 mm)	10	10	10
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score lo	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score _123_

NOTES/COMMENTS; Steep, high banks outside "bankfull" elevation.

High Gradient Stream Data Sheet

STREAM NAME: - *Reach 3C*	LOCATION: -
STATION: / DRAINAGE AREA (AC) -	BASIN/WATERSHED: *- Kentucky River (North Fork KY River)*
LAT: / LONG:	COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: *-10/25/06* TIME: : ☑ AM ☐ PM	INVESTIGATORS; *- Rob Lewis, Julie Clark*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? ☐ Yes ☑ No

Air temperature *31* °F. Inches rainfall in past 24 hours *0* in

10 % Cloud Cover

P-Chem: Temp (°F) *47* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *236* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width	*2*	ft
Range of Depth	*0.1-0.6*	ft
Average Velocity		ft/s
Discharge		cfs
Est. Reach Length		

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☑ Land Disposal (mining?)	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments ☐ Island ☐ Waterfalls ☐ Other ☑ Culverts

Stream Flow;
☐ Dry ☐ Pooled ☐ Low ☑ Normal ☐ High ☐ Very Rapid or Torrential

Stream Type;
☑ Perennial ☐ Intermittent ☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs ☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Dogwood
Honeysuckle
White Oak

Canopy Cover;
☐ Fully Exposed (0-25%)
☑ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☐ Channelization (☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle *20* %	Run; _____ %	Pool *80* %
Silt/Clay (<0.06 mm)	40		60
Sand (0.06-2 mm)	20		20
Gravel (2-64 mm)	20		20
Cobble (64-256 mm)	20		
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score __123_

NOTES/COMMENTS; Watershed appears to have been mined or logged.

High Gradient Stream Data Sheet

STREAM NAME: - *Reach 3D*	LOCATION: -
STATION: / DRAINAGE AREA (AC) -	BASIN/WATERSHED: *- Kentucky River (North Fork KY River)*
LAT: / LONG:	COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: *-10/25/06* TIME: : ☑ AM ☐ PM	INVESTIGATORS; *- Rob Lewis, Julie Clark*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? ☐ Yes ☑ No

Air temperature *30* °C. Inches rainfall in past 24 hours *0* in

10 % Cloud Cover

P-Chem: Temp (°C) *49* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *153* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width *3* ft
Range of Depth *0.1-0.3* ft
Average Velocity _____ ft/s
Discharge _____ cfs.
Est. Reach Length _____

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments ☐ Island ☐ Waterfalls ☐ Other ☑ Culverts

Stream Flow;
☐ Dry ☐ Pooled ☐ Low ☑ Normal ☐ High ☐ Very Rapid or Torrential

Stream Type;
☑ Perennial ☐ Intermittent ☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☐ Shrubs ☐ Grasses ☑ Herbaceous
Number of Strata *2*

Dom. Tree/Shrub Taxa
Beech
Sugar Maple
Rubus sp.

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☐ Channelization (☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle 30 %	Run; 30 %	Pool 40 %
Silt/Clay (<0.06 mm)	20	20	60
Sand (0.06-2 mm)			
Gravel (2-64 mm)	50	50	30
Cobble (64-256 mm)	30	30	10
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas. "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score _127_

NOTES/COMMENTS; Entrenched, may have been channelized in the past.

High Gradient Stream Data Sheet

STREAM NAME: - *Reach EPH.#2 (Fill Site #1)*			LOCATION: -
STATION:	DRAINAGE AREA (AC) -		BASIN/WATERSHED - *Kentucky River (North Fork KY River)*
LAT:	LONG:		COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: *-10/05/04*	TIME: : ☐ AM ☐PM		INVESTIGATORS; *- Darren Parrent*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☑	☑Clear/sunny

Has there been a heavy rain in the last 7 days? ☐Yes ☑No

Air temperature *70* °C. Inches rainfall in past 24 hours *0* in

0 % Cloud Cover

P-Chem: Temp (°F) *60* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *164* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width *3* ft
Range of Depth *0* ft
Average Velocity _____ ft/s
Discharge _____ cfs
Est. Reach Length _____

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☑ Dry ☐ Pooled ☐ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☐ Intermittent
☑ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Sugar Maple
Beech
Spicebush

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☐ Channelization
☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle *33* %	Run; *33* %	Pool *33* %
Silt/Clay (<0.06 mm)	20	20	30
Sand (0.06-2 mm)			
Gravel (2-64 mm)	40	40	40
Cobble (64-256 mm)	40	40	30
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 **16**	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 **6**	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score _117_

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: - *Reach 7A*	LOCATION: -
STATION: DRAINAGE AREA (AC) -	BASIN/WATERSHED - *Kentucky River (North Fork KY River)*
LAT: LONG:	COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: *-10/26/06* TIME: : ☑ AM ☐PM	INVESTIGATORS; *- Rob Lewis, Julie Clark*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☑	☐ Intermittent showers
☐	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? ☐Yes ☑No

Air temperature *32* °C. Inches rainfall in past 24 hours *0* in

100 % Cloud Cover

P-Chem: Temp (°F) *49* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *195* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width	*3*	ft
Range of Depth	*0.1-0.4*	ft
Average Velocity	_____	ft/s
Discharge	_____	cfs
Est. Reach Length	_____	

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☑ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments ☐ Island ☐ Waterfalls ☐ Other ☐ Culverts

Stream Flow;
☐ Dry ☐ Pooled ☐ Low ☑ Normal ☐ High ☐ Very Rapid or Torrential

Stream Type;
☑ Perennial ☐ Intermittent ☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☐ Trees ☑ Shrubs ☐ Grasses ☑ Herbaceous
Number of Strata *2*

Dom. Tree/Shrub Taxa
Yellow Poplar
Beech
Golden Rod

Canopy Cover;
☑ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☑ Channelization (☑ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle 40 %	Run; _____ %	Pool 60 %
Silt/Clay (<0.06 mm)	20		20
Sand (0.06-2 mm)			
Gravel (2-64 mm)	20		10
Cobble (64-256 mm)	10		
Boulders (>256 mm)			
Bedrock	50		70

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10** 9 8 7 6	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15** 14 13 12 11	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10** 9 8 7 6	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scar.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2** 1 0
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2** 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4** **3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4** **3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1** **0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2** 1 0

Total Score __78__

NOTES/COMMENTS; Channelized by Shacks Branch Road. Water is orange.

High Gradient Stream Data Sheet

STREAM NAME: - *Reach 7B*	LOCATION: -
STATION: / DRAINAGE AREA (AC) -	BASIN/WATERSHED - *Kentucky River (North Fork KY River)*
LAT: LONG:	COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: *-10/26/06* TIME: : ☑ AM ☐ PM	INVESTIGATORS; *- Rob Lewis, Julie Clark*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☑	☐ Intermittent showers
☐	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? ☐ Yes ☑ No

Air temperature *32* °F. Inches rainfall in past 24 hours *0* in

100 % Cloud Cover

P-Chem: Temp (°F) *48* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *195* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width	*6*	ft
Range of Depth	*0.1-0.6*	ft
Average Velocity	_____	ft/s
Discharge	_____	cfs
Est. Reach Length	_____	

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☑ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments ☐ Island ☐ Waterfalls ☐ Other ☐ Culverts

Stream Flow;
☐ Dry ☐ Pooled ☐ Low ☑ Normal ☐ High ☐ Very Rapid or Torrential

Stream Type;
☑ Perennial ☐ Intermittent ☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☐ Shrubs ☐ Grasses ☑ Herbaceous
Number of Strata *2*

Dom. Tree/Shrub Taxa
Sugar Maple
Sycamore
Slippery Elm

Canopy Cover;
☐ Fully Exposed (0-25%)
☑ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☑ Channelization (☑ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle *70* %	Run; _____ %	Pool *30* %
Silt/Clay (<0.06 mm)	10		10
Sand (0.06-2 mm)	10		20
Gravel (2-64 mm)	40		60
Cobble (64-256 mm)	30		10
Boulders (>256 mm)	10		
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 115

NOTES/COMMENTS; Steep banks, entrenched

High Gradient Stream Data Sheet

STREAM NAME: - *Reach 7C*	LOCATION: -
STATION: / DRAINAGE AREA (AC) -	BASIN/WATERSHED - *Kentucky River (North Fork KY River)*
LAT: LONG:	COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: *-10/26/06* TIME: : ☑ AM ☐ PM	INVESTIGATORS; *- Rob Lewis, Julie Clark*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☑	☐ Intermittent showers
☐	☑ Clear/sunny

Has there been a heavy rain in the last 7 days? ☐ Yes ☑ No

Air temperature *32* °F. Inches rainfall in past 24 hours *0* in

100 % Cloud Cover

P-Chem: Temp (°F) *48* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *191* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width *6* ft
Range of Depth *0.1-0.6* ft
Average Velocity _____ ft/s
Discharge _____ cfs
Est. Reach Length _____

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☐ Forest
☐ Deep Mining	☑ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☑ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments ☐ Island ☐ Waterfalls ☐ Other ☑ Culverts

Stream Flow;
☐ Dry ☐ Pooled ☐ Low ☑ Normal ☐ High ☐ Very Rapid or Torrential

Stream Type;
☑ Perennial ☐ Intermittent ☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs ☐ Grasses ☐ Herbaceous
Number of Strata *2*

Dom. Tree/Shrub Taxa
White Pine
Sunflower sp.

Canopy Cover;
☐ Fully Exposed (0-25%)
☑ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☑ Channelization (☑ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle *33* %	Run; *33* %	Pool *33* %
Silt/Clay (<0.06 mm)	25	15	20
Sand (0.06-2 mm)	25	15	20
Gravel (2-64 mm)	25	30	40
Cobble (64-256 mm)	25	40	20
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 (11)**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 (18) 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**(10) 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 (8) 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 (6)**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 (6)**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 (4) 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 (4) 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 (1) 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 (1) 0**

Total Score 95

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: - *Reach 8A*	LOCATION: -
STATION: / DRAINAGE AREA (AC) -	BASIN/WATERSHED: *- Kentucky River (North Fork KY River)*
LAT: LONG:	COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: *-10/26/06* TIME: __:__ ☐ AM ☑PM	INVESTIGATORS; *- Rob Lewis, Julie Clark*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☑	☐ Intermittent showers
☐	☑Clear/sunny

Has there been a heavy rain in the last 7 days? ☐Yes ☑No

Air temperature *33* °F. Inches rainfall in past 24 hours *0* in

100 % Cloud Cover

P-Chem: Temp (°F) *49* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *120* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width *3* ft
Range of Depth *0.1-0.3* ft
Average Velocity _____ ft/s
Discharge _____ cfs
Est. Reach Length _____

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☑ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments ☐ Island ☐ Waterfalls ☐ Other ☐ Culverts

Stream Flow;
☐ Dry ☐ Pooled ☐ Low ☑ Normal ☐ High ☐ Very Rapid or Torrential

Stream Type;
☑ Perennial ☐ Intermittent ☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs ☐ Grasses ☐ Herbaceous
Number of Strata *2*

Dom. Tree/Shrub Taxa
White Pine
Beech
Paw paw

Canopy Cover;
☑ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☑ Channelization (☑ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle 30 %	Run; _____ %	Pool 70 %
Silt/Clay (<0.06 mm)			
Sand (0.06-2 mm)	10		10
Gravel (2-64 mm)	20		30
Cobble (64-256 mm)	30		20
Boulders (>256 mm)			
Bedrock	40		40

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 **6**	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 **6**	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score **98**

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: - *Reach 8B*			LOCATION: -
STATION:	DRAINAGE AREA (AC) -		BASIN/WATERSHED - *Kentucky River (North Fork KY River)*
LAT:	LONG:		COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: *-10/26/06*	TIME: : ☐ AM ☑PM		INVESTIGATORS; *- Rob Lewis, Julie Clark*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ / ☐ Heavy rain
- ☐ / ☐ Steady rain
- ☑ / ☐ Intermittent showers
- ☐ / ☑ Clear/sunny

Has there been a heavy rain in the last 7 days? ☐ Yes ☑ No

Air temperature *39* °F. Inches rainfall in past 24 hours *0* in

100 % Cloud Cover

P-Chem: Temp (°F) *51* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *96* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width *5* ft
Range of Depth *0.1-0.4* ft
Average Velocity _____ ft/s
Discharge _____ cfs
Est. Reach Length _____

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☐ Dry ☐ Pooled ☐ Low ☑ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☑ Perennial ☐ Intermittent
☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☐ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *2*

Dom. Tree/Shrub Taxa
Beech
Christmas fern

Canopy Cover;
☐ Fully Exposed (0-25%)
☑ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle *40* %	Run; _____ %	Pool *60* %
Silt/Clay (<0.06 mm)	20		40
Sand (0.06-2 mm)			30
Gravel (2-64 mm)	60		30
Cobble (64-256 mm)	20		
Boulders (>256 mm)			
Bedrock	A few points visible		

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 (12) 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 (16)**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 (17) 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 (12) 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 (4) 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 (4) 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 (6)**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 (6)**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank (10) 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank (10) 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 132

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: - *Reach 8C*			LOCATION: -
STATION:	DRAINAGE AREA (AC) -		BASIN/WATERSHED - *Kentucky River (North Fork KY River)*
LAT:	LONG:		COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: *-10/26/06*	TIME: : ☐ AM ☑PM		INVESTIGATORS; *- Rob Lewis, Julie Clark*

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER:

Now	Past 24 hours	Has there been a heavy rain in the last 7 days?
☐	☐ Heavy rain	☐Yes ☑No
☐	☐ Steady rain	Air temperature *40* °F. Inches rainfall in past 24 hours *0* in
☐	☐ Intermittent showers	*100* % Cloud Cover
☑	☑Clear/sunny	

P-Chem: Temp (°F) *50* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *105* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width	*4*	ft
Range of Depth	*0 – 0.5*	ft
Average Velocity		ft/s
Discharge		cfs
Est. Reach Length		

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☑ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☐ Dry ☐ Pooled ☐ Low ☑ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☑ Perennial ☐ Intermittent
☐ Ephemeral ☐ Seep

Riparian Vegetation:
Dominate Type:
☑ Trees ☑ Shrubs
☐ Grasses ☑ Herbaceous
Number of Strata *3*

Dom. Tree/Shrub Taxa
Beech
Yellow Poplar
Sugar Maple

Canopy Cover;
☐ Fully Exposed (0-25%)
☐ Partially Exposed (25-50%)
☑ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☐ Channelization
(☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle *50* %	Run; *30* %	Pool *20* %
Silt/Clay (<0.06 mm)	10	10	20
Sand (0.06-2 mm)	20	20	30
Gravel (2-64 mm)	30	30	40
Cobble (64-256 mm)	30	30	10
Boulders (>256 mm)			
Bedrock	10	10	

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score __121_

NOTES/COMMENTS;

High Gradient Stream Data Sheet

STREAM NAME: - *Reach 8D*			LOCATION: -
STATION:	DRAINAGE AREA (AC) -		BASIN/WATERSHED - *Kentucky River (North Fork KY River)*
LAT:	LONG:		COUNTY; *-Breathitt* USGS 7.5 TOPO; *-Jackson*
DATE: -	TIME: : ☐ AM ☐PM		INVESTIGATORS; -

TYPE SAMPLE: ☐ P-CHEM ☐ Macroinvertebrate ☐ FISH ☐ BACT.

WEATHER: Now / Past 24 hours

- ☐ / ☐ Heavy rain
- ☐ / ☐ Steady rain
- ☐ / ☐ Intermittent showers
- ☐ / ☐ Clear/sunny

Has there been a heavy rain in the last 7 days? ☐Yes ☐No

Air temperature _____ °F. Inches rainfall in past 24 hours *0* in

_____ % Cloud Cover

P-Chem: Temp (°F) *60* D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. *96* ☐ Grab

INSTREAM WATERSHED FEATURES

Stream Width	*7*	ft
Range of Depth	*0.1-0.4*	ft
Average Velocity		ft/s
Discharge		cfs
Est. Reach Length		

LOCAL WATERSHED FEATURES:

Predominant Surrounding Land Use:

☐ Surface Mining	☐ Construction	☐ Forest
☐ Deep Mining	☐ Commercial	☐ Pasture/Grazing
☐ Oil Wells	☐ Industrial	☐ Silviculture
☐ Land Disposal	☐ Row Crops	☐ Urban Runoff/Storm Sewers

Hydraulic Structures:
☐ Dams ☐ Bridge Abutments
☐ Island ☐ Waterfalls
☐ Other ☐ Culverts

Stream Flow;
☐ Dry ☐ Pooled ☑ Low ☐ Normal
☐ High ☐ Very Rapid or Torrential

Stream Type;
☐ Perennial ☑ Intermittent
☐ Ephemeral ☐ Seep

Riparian Vegetation: Dom. Tree/Shrub Taxa
Dominate Type:
☐ Trees ☐ Shrubs
☐ Grasses ☐ Herbaceous
Number of Strata _____

Canopy Cover;
☐ Fully Exposed (0-25%)
☑ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

Channel Alterations;
☐ Dredging
☐ Channelization
☐ Full ☐ Partial)

Substrate ☑ Est. ☐ P.C	Riffle _____ %	Run; _____ %	Pool 100 %
Silt/Clay (<0.06 mm)			100
Sand (0.06-2 mm)			
Gravel (2-64 mm)			
Cobble (64-256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20-% stable habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 **(17)** 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 **(11)**	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow. Deep > 1.5 feet.	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	Only 2 of the 4 habitat regimes present (if fast-shallow or slow shallow are missing, score low)	Dominated by 1 velocity/depth regime.
SCORE	20 19 18 17 16	15 14 13 12 11	**(10)** 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion of cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Frequency of Riffles	Occurrence of riffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	Occurrence of riffles infrequent; distance between riffles divided by stream width is between 7 to 15.	Occasional riffle or bend: bottom contours provide some habitat; distance between riffles divided by stream width is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width is > than 25.
SCORE	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable, many eroded areas, "raw" areas frequently along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruptive of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
10. Riparian Vegetative Zone Width (score each bank riparian zone).	Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	**Left Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**
SCORE (RB)	**Right Bank 10 9**	**8 7 6**	**5 4 3**	**2 1 0**

Total Score 126

NOTES/COMMENTS;

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
(Family Level Taxonomy - All Habitats)

[redacted]

EII Model

[redacted]

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	7	no units
2. Embeddedness	5	no units
3. Velocity/Depth Regime	5	no units
4. Sediment Deposition	10	no units
5. Channel Flow Status	18	no units
6. Channel Alteration	11	no units
7. Freq. Of Riffles (bends)	5	no units
8. Bank stability (both combined)	12	no units
9. Veg. Protection (both combined)	10	no units
10. Riparian Width (both combined)	10	no units
Total Habitat Score	93	no units

[redacted]

Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units
[redacted]	NA	
[redacted]	449	

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
****(Family Level Taxonomy - All Habitats)****

[redacted]

EII **Model**

[redacted]

Variables	Measure	Units

Enter quantitative or categorical measure from Field Data Sheet in shaded cells

RBP Habitat Parameters

1. Epifaunal Substrate	10	no units
2. Embeddedness	8	no units
3. Velocity/Depth Regime	7	no units
4. Sediment Deposition	11	no units
5. Channel Flow Status	10	no units
6. Channel Alteration	17	no units
7. Freq. Of Riffles (bends)	12	no units
8. Bank stability (both combined)	14	no units
9. Veg. Protection (both combined)	16	no units
10. Riparian Width (both combined)	18	no units
Total Habitat Score	123	no units

[redacted]

Macroinvertebrate Data - Family Level (All Habitats)

11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units

[redacted] NA

[redacted] 115

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
(Family Level Taxonomy - All Habitats)

[redacted]

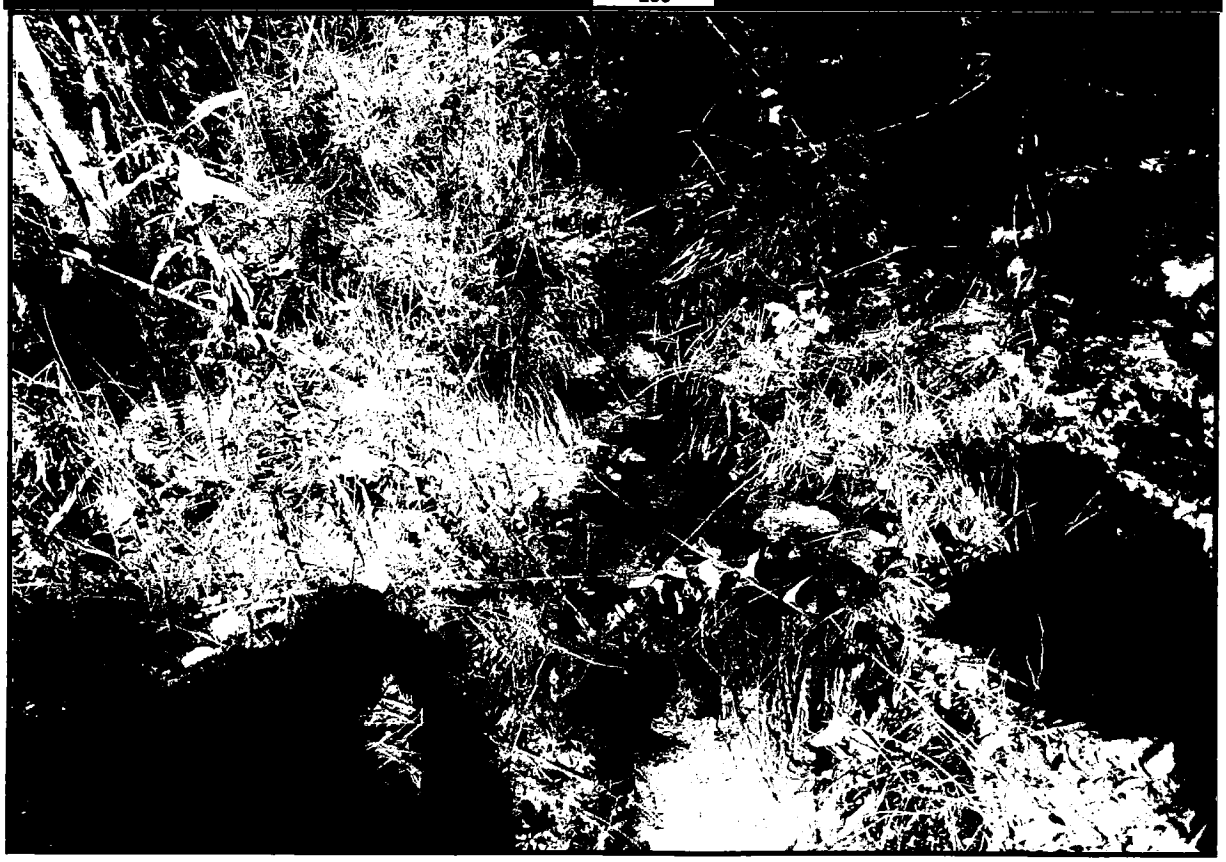
EII Model

[redacted]

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	11	no units
2. Embeddedness	4	no units
3. Velocity/Depth Regime	10	no units
4. Sediment Deposition	9	no units
5. Channel Flow Status	17	no units
6. Channel Alteration	15	no units
7. Freq. Of Riffles (bends)	12	no units
8. Bank stability (both combined)	17	no units
9. Veg. Protection (both combined)	16	no units
10. Riparian Width (both combined)	12	no units
Total Habitat Score	123	no units

[redacted]

Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units
[redacted]	NA	
[redacted]	236	



EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
(Family Level Taxonomy - All Habitats)

[redacted]

EII Model

[redacted]

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	12	no units
2. Embeddedness	10	no units
3. Velocity/Depth Regime	7	no units
4. Sediment Deposition	12	no units
5. Channel Flow Status	9	no units
6. Channel Alteration	18	no units
7. Freq. Of Riffles (bends)	15	no units
8. Bank stability (both combined)	12	no units
9. Veg. Protection (both combined)	14	no units
10. Riparian Width (both combined)	18	no units
Total Habitat Score	127	no units

[redacted]

Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units
[redacted]	NA	
[redacted]	153	

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
"(Family Level Taxonomy - All Habitats)"

[redacted]

EII **Model**

[redacted]

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	16	no units
2. Embeddedness	6	no units
3. Velocity/Depth Regime	8	no units
4. Sediment Deposition	5	no units
5. Channel Flow Status	0	no units
6. Channel Alteration	16	no units
7. Freq. Of Riffles (bends)	16	no units
8. Bank stability (both combined)	16	no units
9. Veg. Protection (both combined)	14	no units
10. Riparian Width (both combined)	20	no units
Total Habitat Score	117	no units

[redacted]

Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units
[redacted]	NA	
[redacted]	164	

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
(Family Level Taxonomy - All Habitats)

[redacted]

EII Model

[redacted]

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	5	no units
2. Embeddedness	8	no units
3. Velocity/Depth Regime	7	no units
4. Sediment Deposition	10	no units
5. Channel Flow Status	15	no units
6. Channel Alteration	10	no units
7. Freq. Of Riffles (bends)	11	no units
8. Bank stability (both combined)	4	no units
9. Veg. Protection (both combined)	6	no units
10. Riparian Width (both combined)	2	no units
Total Habitat Score	78	no units

[redacted]

Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units

[redacted] NA

[redacted] 195

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
****(Family Level Taxonomy - All Habitats)****

[redacted]

EII **Model**

[redacted]

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	14	no units
2. Embeddedness	13	no units
3. Velocity/Depth Regime	8	no units
4. Sediment Deposition	8	no units
5. Channel Flow Status	18	no units
6. Channel Alteration	12	no units
7. Freq. Of Riffles (bends)	16	no units
8. Bank stability (both combined)	12	no units
9. Veg. Protection (both combined)	8	no units
10. Riparian Width (both combined)	6	no units
Total Habitat Score	115	no units
Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units
	NA	
	195	

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
****(Family Level Taxonomy - All Habitats)****

[redacted]

EII **Model**

[redacted]

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	8	no units
2. Embeddedness	9	no units
3. Velocity/Depth Regime	9	no units
4. Sediment Deposition	11	no units
5. Channel Flow Status	18	no units
6. Channel Alteration	10	no units
7. Freq. Of Riffles (bends)	8	no units
8. Bank stability (both combined)	12	no units
9. Veg. Protection (both combined)	8	no units
10. Riparian Width (both combined)	2	no units
Total Habitat Score	95	no units

[redacted]

Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units
[redacted]	NA	
[redacted]	191	

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
(Family Level Taxonomy - All Habitats)

[redacted]

EII Model

[redacted]

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	6	no units
2. Embeddedness	7	no units
3. Velocity/Depth Regime	6	no units
4. Sediment Deposition	10	no units
5. Channel Flow Status	16	no units
6. Channel Alteration	9	no units
7. Freq. Of Riffles (bends)	13	no units
8. Bank stability (both combined)	9	no units
9. Veg. Protection (both combined)	12	no units
10. Riparian Width (both combined)	10	no units
Total Habitat Score	98	no units

[redacted]

Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units
[redacted]	NA	
	120	

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
(Family Level Taxonomy - All Habitats)

[redacted]

EII Model

[redacted]

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	11	no units
2. Embeddedness	15	no units
3. Velocity/Depth Regime	9	no units
4. Sediment Deposition	12	no units
5. Channel Flow Status	16	no units
6. Channel Alteration	17	no units
7. Freq. Of Riffles (bends)	12	no units
8. Bank stability (both combined)	8	no units
9. Veg. Protection (both combined)	12	no units
10. Riparian Width (both combined)	20	no units
Total Habitat Score	132	no units
[redacted]		
Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units
[redacted]	NA	
[redacted]	96	

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
(Family Level Taxonomy - All Habitats)

[redacted]

EII Model

[redacted]

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	14	no units
2. Embeddedness	8	no units
3. Velocity/Depth Regime	9	no units
4. Sediment Deposition	11	no units
5. Channel Flow Status	8	no units
6. Channel Alteration	15	no units
7. Freq. Of Riffles (bends)	16	no units
8. Bank stability (both combined)	8	no units
9. Veg. Protection (both combined)	12	no units
10. Riparian Width (both combined)	20	no units
Total Habitat Score	121	no units

[redacted]

Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units
[redacted]	NA	
[redacted]	105	

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
****(Family Level Taxonomy - All Habitats)****

[redacted]

EII **Model**

[redacted]

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	17	no units
2. Embeddedness	11	no units
3. Velocity/Depth Regime	10	no units
4. Sediment Deposition	6	no units
5. Channel Flow Status	1	no units
6. Channel Alteration	15	no units
7. Freq. Of Riffles (bends)	16	no units
8. Bank stability (both combined)	14	no units
9. Veg. Protection (both combined)	16	no units
10. Riparian Width (both combined)	20	no units
Total Habitat Score	126	no units

[redacted]

Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units
[redacted]	NA	
[redacted]	96	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Intermittent Streams

Project ID:
Breathitt Co., Item No. 10-270.60 & .70

Stream/Reach:
Reach 2 Intermittent

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.16	EII (0-1)
Impact Length =	524	(ft)
Compensatory Mitigation Ratio =	[illegible]	-
In-Lieu Fee (adjusted to offset cumulative impacts) =	[illegible]	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Perennial Streams

Project ID:
Breathitt Co., Item No. 10-270.06 & .07

Stream/Reach:
Reach 3B, Perennial

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.67	EII (0-1)
Impact Length =	391	(ft)
Compensatory Mitigation Ratio =	1.2:1	
In-Lieu Fee (adjusted to offset cumulative impacts) =	$117,534.60	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Perennial Streams

Project ID:
Breathitt Co., Item No. 10-270.06 & .07

Stream/Reach:
Reach 3C, Perennial

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.54	EII (0-1)
Impact Length =	961	(ft)
Compensatory Mitigation Ratio =	2.31	
In-Lieu Fee (adjusted to offset cumulative impacts) =	$169,369.20	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Perennial Streams

Project ID:
Breathitt Co., Item No. 10-270.06 & .07

Stream/Reach:
Reach 3D, Perennial

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.68	EII (0-1)
Impact Length =	619	(ft)
Compensatory Mitigation Ratio =	2.04	
In-Lieu Fee (adjusted to offset cumulative impacts) =	$187,165.60	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Ephemeral Streams

Project ID:
Breathitt Co., Item No. 10-270.6 & .7

Stream/Reach:
EPH#2 (Roadway)

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.62	EII (0-1)
Impact Length =	253	(ft)
Compensatory Mitigation Ratio =	**0.81**	
In-Lieu Fee (adjusted to offset cumulative impacts) =	**$24,591.60**	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Ephemeral Streams

Project ID:
Breathitt Co., Item No. 10-270.6 & .7

Stream/Reach:
EPH#2 (Fill Site #1)

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.62	EII (0-1)
Impact Length =	755	(ft)
Compensatory Mitigation Ratio =	**0.81**	
In-Lieu Fee (adjusted to offset cumulative impacts) =	**$73,386.00**	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Perennial Streams

Project ID:
Breathitt Co., Item No. 10-270.06 & .07

Stream/Reach:
Reach 7A, Perennial

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.49	EII (0-1)
Impact Length =	477	(ft)
Compensatory Mitigation Ratio =	[illegible]	
In-Lieu Fee (adjusted to offset cumulative impacts) =	[illegible]	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Perennial Streams

Project ID:
Breathitt Co., Item No. 10-270.06 & .07

Stream/Reach:
Reach 7B, Perennial

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.56	EII (0-1)
Impact Length =	666	(ft)
Compensatory Mitigation Ratio =	1.5:1	
In-Lieu Fee (adjusted to offset cumulative impacts) =	$135,081.60	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Perennial Streams

Project ID:
Breathitt Co., Item No. 10-270.06 & .07

Stream/Reach:
Reach 7C, Perennial

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.49	EII (0-1)
Impact Length =	760	(ft)
Compensatory Mitigation Ratio =	2:1	
In-Lieu Fee (adjusted to offset cumulative impacts) =	$203,490.00	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Perennial Streams

Project ID:
Breathitt Co., Item No. 10-270.06 & .07

Stream/Reach:
Reach 8A, Perennial

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.55	EII (0-1)
Impact Length =	1262	(ft)
Compensatory Mitigation Ratio =	**2.33**	
In-Lieu Fee (adjusted to offset cumulative impacts) =	**$352,096.00**	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Perennial Streams

Project ID:
Breathitt Co., Item No. 10-270.06 & .07

Stream/Reach:
Reach 8B, Perennial

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.71	EII (0-1)
Impact Length =	1790	(ft)
Compensatory Mitigation Ratio =	1.5 : 1	
In-Lieu Fee (adjusted to offset cumulative impacts) =	$ 380,962.00	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Perennial Streams

Project ID:
Breathitt Co., Item No. 10-270.6 & .7

Stream/Reach:
Reach 8C (Fill), Perennial

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.66	EII (0-1)
Impact Length =	649	(ft)
Compensatory Mitigation Ratio =	**2.49**	
In-Lieu Fee (adjusted to offset cumulative impacts) =	**$193,921.20**	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Perennial Streams

Project ID:
Breathitt Co., Item No. 10-270.06 & .07

Stream/Reach:
Reach 8C (Roadway), Perennial

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.66	EII (0-1)
Impact Length =	417	(ft)
Compensatory Mitigation Ratio =	**2.49**	
In-Lieu Fee (adjusted to offset cumulative impacts) =	**$124,599.60**	

In-Lieu Fee Compensatory Mitigation Calculator (Version 2002.8)

Intermittent Streams

Project ID:
Breathitt Co., Item No. 10-270.06 & .07

Stream/Reach:
Reach 8D, Intermittent

		UNITS
Loss of Ecological Integrity/running foot due to Project Impacts =	0.68	EII (0-1)
Impact Length =	1410	(ft)
Compensatory Mitigation Ratio =	1.68	-
In-Lieu Fee (adjusted to offset cumulative impacts) =	$284,256.00	